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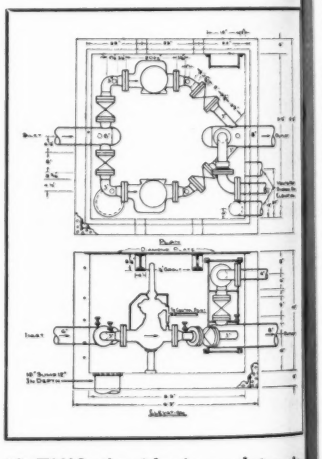

IS THIS the ideal regulator station? See pages 40-45.

Thermally Thinking

the editors

The News That Confuses

SHIFTING POLITICAL winds across the gas regulation landscape in Washington in recent weeks have the so-called pundits down in their cellars, hunting for old crystal balls. The ones used in every-day forecasting seem to have lost their focus.

The Phillips Petroleum case decision was the biggest upsetter. When the Federal Power Commission voted 4-to-1, with who else but Thomas Buchanan dissenting, against declaring the leading producer a "natural gas company," some quarters saw it as a manifestation of a personal split between President Truman and Chairman Mon C. Wallgren. Mr. Truman, it will be remembered, scotched the Kerr bill exempting arm's-length sellers from commission jurisdiction, and as a party wheelhorse Mr. Wallgren was to be expected to accept this as a directive to push ahead with expansion of jurisdictional fields.

But when he didn't, and when Mr. Truman failed to take his cue, or whatever he was supposed to do, at his next press conference, that clinched it. Viewers-with-alarm, who had gotten themselves tremendously worked up—during the Kerr bill debate—over the thought that 40 million gas users might be soaked an extra dollar a month (according to Sen. Paul Douglas' estimate), couldn't see any consistency in the veto, on the one hand, and the President's blase attitude toward the Phillips case on the other.

Perhaps, at that, the President is correct in deciding that the two cases are not necessarily parallel. By vetoing the Kerr bill, the President merely decreed that Congress could not prevent FPC from extending its jurisdiction to include a field most people don't feel the Natural Gas Act ever entitled it to anyway. By declaring Phillips outside its jurisdiction, the FPC didn't necessarily say that all independent producers would be exempt. Everyone should know by now that FPC is no respector of precedent.

Nonetheless, for now the ruling may be considered a victory for gasmen. Said K. S. Adams, Phillips chairman:

"The decision means that the commission is satisfied with its previous rulings extending over a period of 11 years that sales by independent producers and gatherers are not subject to regulation. This is a signal victory for producers. It is also a victory for the consuming public, though some of their representatives in these proceedings do not seem to realize it.

"It is hoped that this will be the end of agitation, with each change in membership of the commission, to reverse previous decisions . . ."

Mr. Adams promised that "greater supplies and free competition between gas producers and with other fuels will hold prices at reasonable levels."

Some gasmen were not so optimistic. R. B. Anderson of Vernon, Texas, president of the Texas Mid-Continent Oil & Gas Assn., warned that "previous overnight switches in commission policy on this question have made Texas oil and gas producers mindful of the need to examine carefully the formal order and to await a crystallization of policy before making long-range plans as to their gas sales."

J. Ed Warren, president of the Independent Petroleum Assn. of America, also expressed a sobering thought: the case may be appealed. His prediction appears sound. It is dubious that state and municipal governments in, principally, Wisconsin, will let the issue die without at least trying to get the decision into the courts.

The Wonderland touch in the Phillips affair was the peculiar shifting in bedfellows. State bodies, usually at odds with the FPC over its propensity for grabbing more power, were angry with it because it wouldn't. Gasmen, usually lined up with state bodies in opposition to FPC, were pleasantly surprised when FPC began fighting the states.

What's PAD Up To?

THE HUE AND CRY raised by Petroleum Administrator Chapman's announcement last month that he was considering a nation-wide space-heating ban was deafening. It was also responsible for some of the speediest back-pedaling in the department's recent history. In no time at all PAD had iffed, anded, and butted its way into a more easily compromising position.

The funny part about the order was that it was supposedly approved by some of the good gasmen serving in Mr. Chapman's department.

At first it looked like it might have been a trial balloon, but subsequent events have not borne out this reaction.

Here's the chronology:

On July 5, Deputy Administrator Brown announced that, because of the shortage of steel, industry groups were "being asked to help PAD devise a means of limiting gas use in order to protect present customers and issue the supplies needed for defense activities." A tentative nationwide order had been drafted, he said, that would "bar suppliers after a given date from supplying:

"1. Any new space heating customers.

"2. Any new large volume customers without approval by PAD."

That did it. GAMA, growing steadily in its public relations know-how, let go with a blast. Builders, plumbers, gas appliance dealers, and their associations also unlimbered their big guns. Space doesn't permit a recitation of their arguments, which are well-known to most gasmen anyway. In essence, the FPC is the proper party to decide where new gaslines will be built—interstate—and what utilities will get how much. State and local authorities are the ones to promulgate space-heating curtailment orders.

Furthermore, utilities themselves have been the moving force in seeking the bans.

It sounded like just another case of Papa Washington thinking he knows what's best for his 48 kids.

Utility men in the Southwest and other well-supplied areas burned up the wires to Washington to point out to Mr. Chapman the sheer stupidity of curtailing house heating installations on top of old Spindletop, for example. So, to "correct misunderstandings," PAD released a mighty chunk of the U.S.A. from the effect of its contemplated order—Mississippi, Louisiana, and every state west of the Mississippi except "possibly some areas" in Missouri, Iowa, Nebraska, Minnesota, and South Dakota. It appears, said Mr. Chapman in his new announcement, that "a limiting order restricting new business will be necessary in the other states east of the Mississippi river. However, there are areas in many eastern states in which the supply should be sufficient to permit exceptions or modifications . . ."

That may have satisfied half the country, but GAMA and delegates of state regulatory commissions trooped up to Capitol Hill later in the month to do some vis-a-vis battling on the subject.

Meanwhile, Mr. Chapman appeared before the Senate on July 17. Here are some excerpts from his address:

"In order to keep in step with the demand for oil and gas during this defense mobilization period, the domestic oil and gas industry requires about 2,385,000 tons of steel in various shapes and forms for installation of facilities during the fourth quarter of 1951. (Because) . . . the Petroleum Administration for Defense knows that this much steel cannot be made available in the shapes needed . . . it has tailored its allocation request downward . . . to 2,135,000 tons. This figure may be compared with the third quarter allotment actually made by Defense Production Administration in the amount of 1,583,800 tons. This tonnage represented 67% of the actual needs for steel in the third quarter and was 74% of the steel actually used by the oil and gas industry during an average quarter during the first half of 1950.

". . . Approximately 70% of all of the steel required by the oil and gas industry is needed in the form of pipe. If we could obtain the full amount of steel needed for the fourth quarter, 70% would be used as pipe, but due to the unavailability of sufficient plate to produce the required quantities of large-diameter pipe, the percentage figure will drop to 67 even if DPA fully responds to our requests. Approximately 21% of all of the pipe required should be in the form of 'oil country tubular goods' for the oil and gas well-drilling program and the remaining 79% should be line pipe in various sizes and for various purposes. Approximately 55% of the tonnage is required in large diameter pipe, i. e., 16 in. or larger in diameter.

". . . The (gas line construction) program, of course, was completely upset by the scramble for steel that occurred commencing in September, 1950, and continuing down until July 1, 1951, when the Defense Production Administration began its steel allocation program. Out of the relatively meager allotment made PAD for the third quarter of 1951, it was possible to earmark only about 515,000 tons of pipe for gas transmission and distribution lines. This represented less than 60% of the real demand for pipe actually needed in the third quarter to continue construction of projects already in progress. It provided nothing for the starting of new projects. Indeed, under present regulations, no pipeline project can be started without explicit prior permission from PAD.

". . . Despite the need for a gas line to the Pacific Northwest and for additional gas lines into New England, no recognition can be taken of these needs until more pipe is available, and projects under construction can be finished. Overall, the gas transmission projects to be supported with additional pipe in the fourth quarter are already 75% completed.

"Sufficient line pipe has not been available and will not be available in time to permit the completion of all gas transmission projects scheduled to be completed before the winter of 1951-52. That is why the Petroleum Administration for Defense is actively considering the issuance of an order temporarily prohibiting the addition of new house-heating loads and other large-scale loads on gas transmission systems in areas in which it is evident that natural gas will be in short supply.

"The very fact that such an order is under consideration has aroused widespread protests from potential consumers and from appliance manufacturers and distributors. I can well understand their dismay, but I hope that they will understand that the contemplated order is not part of a plot to control the end uses of fuels. Neither is it a scheme to promote the burning of substitute fuels such as coal or oil. As is evident from my report . . . on steel, we are confronted with a distressing practical situation—a condition, not a theory. There is not enough steel pipe to complete, promptly, the projects under construction. When sufficient pipe can be procured and installed, there will be no reason for any restriction.

"Until the lines *can* be completed, there are sound reasons for restraining the imposition of new gas loads on facilities that will not support next winter's peak demand. Our gas experts tell me that should the feared event actually happen and should a community run out of gas, all of the thousands of gas appliances would have to be turned off. Gas service could not again be supplied until the lines had been purged of air and all appliances serviced. This might take large crews of trained men some weeks to accomplish . . . I will leave the discussion of gas supply and possible limitation orders after pointing out that the situation is a simple illustration of cause and effect. No steel—no gas . . ."

Washington observers professed to see in Mr. Chapman's raw appraisal of the steel and gas situation a deliberate move by the PAD to get itself off the spot. The heat is being turned on PAD from many directions, but PAD is saying that the heat should be turned on DPA, which allocates the steel. The Chapman testimony also was said to be a bid for public support for the PAD, which publicly disclaims making any complaints against the low steel allotment given to the oil and gas industry by DPA, but actually is very disappointed.

For a time, as PAD began to bail itself out, if appeared that the agency was merely trying to (literally) scare up some bigger steel allocations for the gas industry. But events of late July (see "Highlights") indicate that the agency plans to stand firm on its modified directive.

Still, it doesn't seem possible that all those good gasmen in PAD could have fallen into the bureaucratic ways of Washington *quite* so fast.

Technical Trends

guy corfield

Gas vs. Electric Cooking Costs

MANY OBSERVATIONS and tests have been made on the comparative performance and costs of gas vs. electric utilization in various types of cooking and heating appliances. It has always been difficult to obtain practical and authentic and convincing data because of the many variables of first cost, operating cost, maintenance, demand factors, rate structures, etc.; and because of the problems of operating both appliances or both sets of appliances under identical conditions or in a manner so that adjustment or correction factors can be applied.

One of the most useful comparisons is obtained by development of a so-called replacement factor, which is the ratio of gas Btu to electric Btu to perform a given service, i. e., the number of Btu consumed by the gas appliance or appliances, divided by the number of kwh of electricity used by the comparable electric appliances (converted to Btu by multiplying by 3412). This ratio is usually greater than unity, indicating that more Btu are used at the gas appliances than at the electric appliances, but when the cost of each type of energy is applied the results are generally well in favor of the gas operation.

A study on which results have just been released, and which provided an unusual opportunity for accurate and practical comparison of cooking and baking costs, has been made at two college cafeterias at Southern Methodist University, Dallas. These two cafeterias, one equipped with gas appliances and the other with electric cooking equipment, are both under the same management and prepare meals of the same type in approximately equal quantities. Through the cooperation of the university, and Lone Star Gas Co., detailed observations and energy consumption measurements were made over a period of 166 days representing the preparation of almost 200,000 meals in each cafeteria.

The overall replacement factor was found to be 1.61, i. e., 1.61 Btu of gas were equivalent to 1 Btu of electricity for cooking and baking, or 0.0549 therms of gas (100,000 Btu equals one therm) were equivalent to 1 kwh of electricity, or 1 therm of gas was equivalent to 18.2 kwh of electricity. These figures provide the data necessary to make operating cost comparisons in terms of rates in any locality as it is evident that if electricity costs 1 cent per kwh, the gas rate for equivalent cooking and baking cost would be 18.2 cents per therm or 18.2 cents per 100 cu ft of 1000-Btu gas.

This study, which was conducted under the sponsorship of the AGA committee on comparison of competitive services, is reported in detail in a 24-page booklet, prepared under the direction of the subcommittee on commercial equipment tests and entitled "Gas and Electric Consumption in Two College Cafeterias." It is available from AGA Headquarters, 420 Lexington Ave., New York 17, at a cost of 50 cents per copy to AGA members and $1 per copy to non-members. It includes a description of the cafeterias, and of the individual gas and electric appliances; outlines typical operation at both cafeterias; discusses the frequency of appliance use and gives breakdowns of performance by groups as well as in total; analyzes the demands and diversity in the electric kitchen; and gives typical menus and the appliances used in their preparation.

Gaseous Fuel Testing

THE WORK of ASTM Committee D-3 on Gaseous Fuels is again mentioned because of its technical importance to the gas industry. The committee now announces the completion, at least in "tentative" form, of its entire program of seven standardized tests for gaseous fuels including:

- Standard Method of Test for Calorific Value of Gaseous Fuels by the Water Flow Calorimeter (D 900-48)
- Tentative Methods of Test for Specific Gravity of Gaseous Fuels (D 1070-49 T)
- Tentative Method of Test for Water Vapor Content of Gaseous Fuels by Measurement of Dew Point Temperature (D 1142-50 T)
- Tentative Method for Analysis of Natural Gases and Related Types of Gaseous Mixtures by the Mass Spectrometer (D 1137-50 T)
- Tentative Method of Sampling Natural Gas (D 1145-50 T)
- Tentative Methods for Measurement of Gaseous Fuel Samples (D 1071-49 T)
- Tentative Method for Analysis of Natural Gases by the Volumetric-Chemical Method (D 1136-50 T).

These seven methods are available in a 144-page, heavy paper covered, 6 x 9 in. book entitled *ASTM Standards on Gaseous Fuels, April 1951*, which can be obtained from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at a cost of $1.35 per copy to ASTM members and $1.75 to non-members.

As stated in the announcement, this book gives the methods in their latest approved form representing in a compact compilation hundreds of hours of research and investigative work, consideration and discussion by some of the country's leading authorities and, finally, approval by vote in the committee and in the society.

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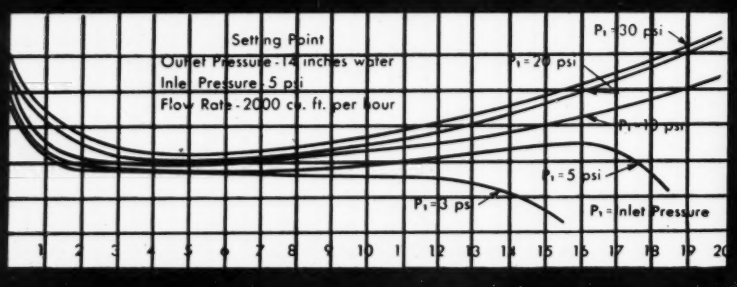
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Outlet Pressure - 14 inches water
Inlet Pressure - 5 psi
Flow Rate - 2000 cu. ft. per hour
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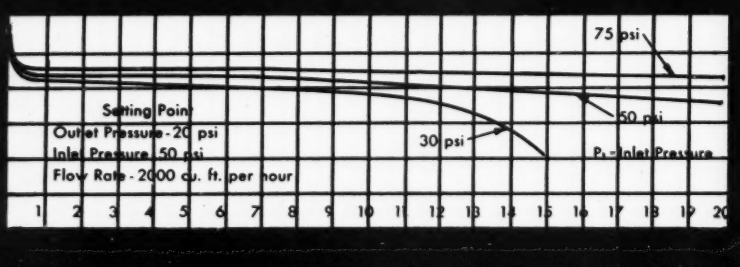
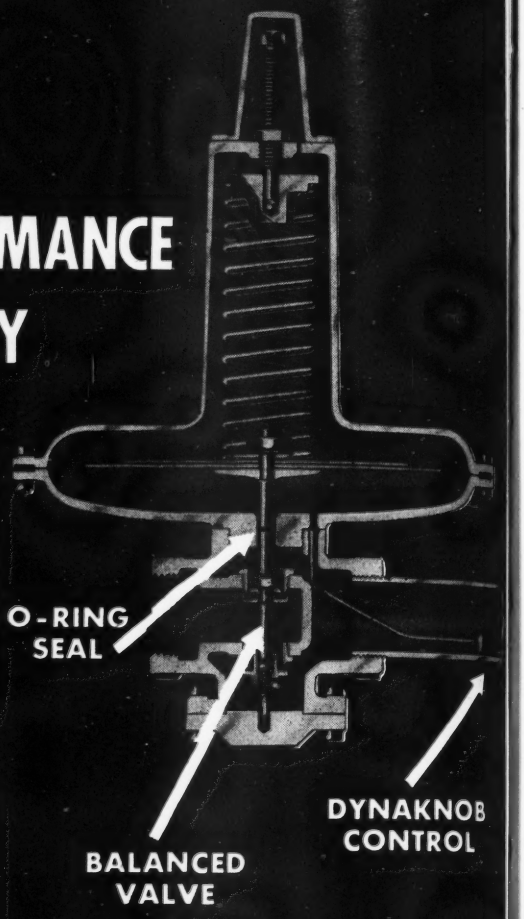
P1 = 20 psi
P1 = 10 psi
P1 = 5 psi
P1 = 3 psi
P1 = Inlet Pressure





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NEGLIGENCE

As a Factor in Determining Utility Liability

By W. E. JOHNS
Coast Counties Gas & Electric Co.

PART I

Of the three principal sources from which legal liability stems—statute, contract, and torts—Mr. Johns narrows his field of study to those which fall under the heading of torts and, further, to negligent acts which fall in this category. This two-part article has been adapted from a paper presented before the PCGA accident prevention and claims group at Coronado, Calif. last February.

WHEN we speak of the liability of utilities for fire and explosions, we are talking about the responsibility which the law imposes for the consequences of the utility acts or omissions. The consequences of which we speak may be death or injury to the person, or damage to property. The law attempts to fix a dollar value to measure the liability or responsibility. We all know that responsibility often goes beyond reimbursement in dollars for the damage done, since there is a great deal at stake in the way of good will.

The legal liability, which is our subject matter, is imposed by law on any one of several legal bases. It may arise from statute, and I cite as an example familiar to you the Workman's Compensation Laws. Liability may arise out of contract, and I am thinking here of various forms of right-of-way documents, permits, licenses, and contracts which contain stringent hold-harmless and indemnity provisions. Finally, liability may arise out of the conduct of a company, its employees or agents, which falls within the body of law called torts.

Gobbledygook

The word "tort" is one of those vague and general terms in the law that requires about 2½ pages of fine type in my dictionary to define. It has been said that a tort is "any wrong, not consisting of mere breach of contract, for which the law undertakes to give to the injured party some appropriate remedy against the wrongdoer."[1] Of course, this is sheer gobbledygook, and if I gave you no other guideposts to work from, you would be quite justified in feeling that the lawyers and the judges had combined to perpetuate their profession.

A tort has been defined as a wrong independent of contract, a breach of duty which the *law* has imposed, as distinguished from a mere contract. A tortious act is defined as the commission or omission of an act by one without right whereby another receives some injury, directly or indirectly, in person, property, or reputation.[2] The California statute provides:

> Every person is bound, without contract, to abstain from injuring the person or property of another, or infringing upon any of his rights.[3]

Torts may be committed by intentional acts, negligent acts, or in the course of ultra-hazardous activities. Since my subject matter relates to fires and explosions and such incidents rarely occur from intentional actions on the part of a utility or its employees, I am not going any deeper into this phase of tort law.

With regard to the term "ultra-hazardous activity," there is a legal doctrine that certain activities create such a serious risk of danger that it is justifiable to place liability for any loss on the person engaging in them, regardless of lack of culpability on his part. An illustration is blasting with explosives in a thickly populated area. The doctrine has also been applied to the consequences of drilling an oil well where a gusher was brought in.[4] I find no authority, however, for applying the doctrine to the activities of utilities which commonly result in fires and explosions. Generally speaking, a gas company is not liable as an insurer for injuries sustained as the result of the escape of gas, and it has been expressly held that the doctrine of absolute liability does not apply in such case.[5]

The third class of torts to which I referred earlier covers those arising from negligent acts. Negligence has been defined as "the failure to observe, for the protection of the interest of another person, that degree of care, protection and vigilance which the circumstances justly demand, whereby such other person suffers injury."[6] The California Civil Code provides:

> Everyone is responsible, not only for the result of his willful acts, but also for an injury occasioned to another by his want of ordinary care or skill in the management of his property or person, except so far as the latter has willfully or by want of ordinary care, brought the injury upon himself. The extent of liability in such cases is defined by the title on Compensatory Relief.[7]

There are three elements which must be shown to constitute negligence:

1. There must be a duty owing by the parties sought to be held to the party injured.
2. There must be a breach of the duty.
3. The injury must result from the breach of duty.[8]

I believe we can profit from an exploration further into the matter of duties. How are they created? How imposed? How defined?

Acquiring "Duties"

Duties may be created and imposed upon a person in a number of ways. One such method is by statute or ordinance. The section of the Civil Code which I quoted imposes a general duty upon all persons. The California Vehicle Code imposes duties with regard to speed on the highway, and so on. Duties may be imposed under the legislative authority, not only by the state, but also by cities and counties through their police ordinances. Administrative agencies, when they issue orders, rules, and

regulations, are exercising the same power, and their regulations have the same effect.

One may become subject to a duty by voluntarily and gratuitously undertaking to do something for another.[9] I recall a situation in which this point was considered as bearing on our gas service. The recommendation had been submitted that we reduce the amount and extent of inspection in schools in our service area. Some of them had domestic science classes with a considerable number of appliances requiring periodic check and adjustment. It appeared that we had voluntarily and gratuitously been providing inspection services in excess of our filed rules, orders of the commission, and our established procedures. In reviewing the recommendation, it was necessary that we consider whether we had not assumed a higher duty on which the school authorities might rely. While we were not irrevocably committed to the increased service, this consideration definitely weighed upon the method by which we should terminate the service.

General Duties Apply

Even in the absence of an express duty imposed by statute, ordinance, or regulation, or a duty which one has assumed, there is a general duty to exercise ordinary care or skill in the management of one's property or person, which arises under the statute which I previously referred to and the decisions of the courts. It is the general duty incumbent upon all persons to so conduct themselves as not to cause injury to others. The standard that has been fixed in such cases is that of the "ordinarily prudent or reasonable person." Obviously, under such a standard, the degree of care which must be exercised in different circumstances will vary according to the hazards involved.[10] In the case of gas companies it has been said that in view of the highly dangerous character of gas and of its tendency to escape, a gas company is required to use great care in its management and control.[11] A similar strict rule is applied in the case of electric utilities.[12] In connection with both, it has been said:

> Where death may be caused by an agency lawfully in use, ordinary care requires that every means known, or that with reasonable inquiry would be known, must be used to prevent it.

You will note that the duty imposed is not only to use every means known to prevent the injury, but also to make reasonable inquiry to discover preventive means. In this connection you may be interested in the rules relating to usage and custom in a particular business.[13] The mere fact that conduct is customary does not, as a matter of law, absolve one from a charge of negligence. Doing things in a negligent manner for a long period of time will not convert the negligence into ordinary care. However, when you depart from the customary way of doing things, and it can be shown that the customary way has generally been a safe method to follow, your departure is evidence against you.

It has been said that the general test of negligence is foreseeability, that is, whether the injury which occurred could have been anticipated.[14] You will probably agree with me that a utility should anticipate anything under the sun.

At this time, it may be helpful to you if we consider some of the specific duties which are imposed upon gas and electric utilities, in the light of the previous discussion. Section 35 of the California Public Utilities Act[15] provides that the commission may investigate the practices of any public utility, and if it finds that they are unsafe, it may determine proper practices and fix them by its order, rule, or regulation. The last sentence of the section states:

> The commission shall prescribe rules and regulations for the performance of any service for the furnishing of any commodity of the character furnished or supplied by any public utility, and, upon proper demand and tender or rates, such public utilities shall furnish such commodity or render such service within the time and upon the conditions provided in such rules.

With regard to gas utilities, the commission has had an order in effect since 1919 prescribing "standards for gas service in the state of California." The present order is numbered General Order No. 58A.[16] Rule 34, entitled "Maintenance and Operation of Facilities," and Rule 6, entitled "Unsafe Equipment," have a counterpart in General Order No. 95, "Rules for Overhead Line Construction," which serves the same purpose for electrical utilities. The announced purpose of General Order No. 95 is stated in Rule 11: "to formulate . . . uniform requirements . . . the application of which will insure adequate service and secure safety to persons engaged in the construction, maintenance, operation or use of overhead electrical lines and to the public in general."

Minimum Service Standards

These orders prescribe minimum standards for the safe construction and operation of gas and electric lines. They are directly applicable to gas and electric utilities. Accordingly, we consider that they are specifying the duties of utilities with regard to their subject matter.

In addition to these requirements which are specified under state law, standards may be prescribed in each city and county by local ordinance. Generally, these take the form of a building code or other code specially applicable to gas and electric installations. You may be familiar with the discussions which have taken place recently with regard to the lack of uniformity in the requirements laid down by the building codes in different jurisdictions. These codes do not have the force of law until they have actually been adopted by the particular jurisdiction by the enactment of an ordinance.

Since we are considering standards prescribed by statute or regulation, our discussion would not be complete without at least mentioning the safety orders issued by the California Division of Industrial Safety under Section 6500 of the Labor Code.

I believe I have covered the major statutory enactments and regulatory codes which apply to utility construction and operations. These prescribe definite standards and rules to go by, and, accordingly, they become the measure of the minimum which will be considered to be due care in any given circumstances. Special conditions often exist which require an increase in the precautions taken to assure safety of employees, the customer and the general public.

Applying the Principles

Let me summarize my remarks to this point. I have attempted to explain to you the legal basis for liability of utilities, and in doing so I have narrowed the field to problems of negligence. Negligence has been defined as "the breach of a legal duty owing to another by reason of which some injury is sustained by the other person." I have attempted to show some of the sources from which duties are imposed on utilities, and I have indicated to you that even in the absence of a specific duty imposed by statute, ordinance, or regulation, there is a general duty to use due care, which in the case of a gas or electric utility means care of an extremely high degree.

With this background in mind, I believe it will be helpful now to consider some of the cases involving utilities where explosions and fires have occurred, to study the application of these principles to specific situations.

With regard to arrangement, I have tried to relate the cases to your system, considering first cases relating to construction and maintenance of lines, then those relating to the turning-on of supply, the inspection and adjustment of appliances, and, finally, shutting-off of supply.

The first few cases will be of particular interest to the engineers who are planning construction. In *Carroll v. Central Counties Gas Co.*[17] the com-

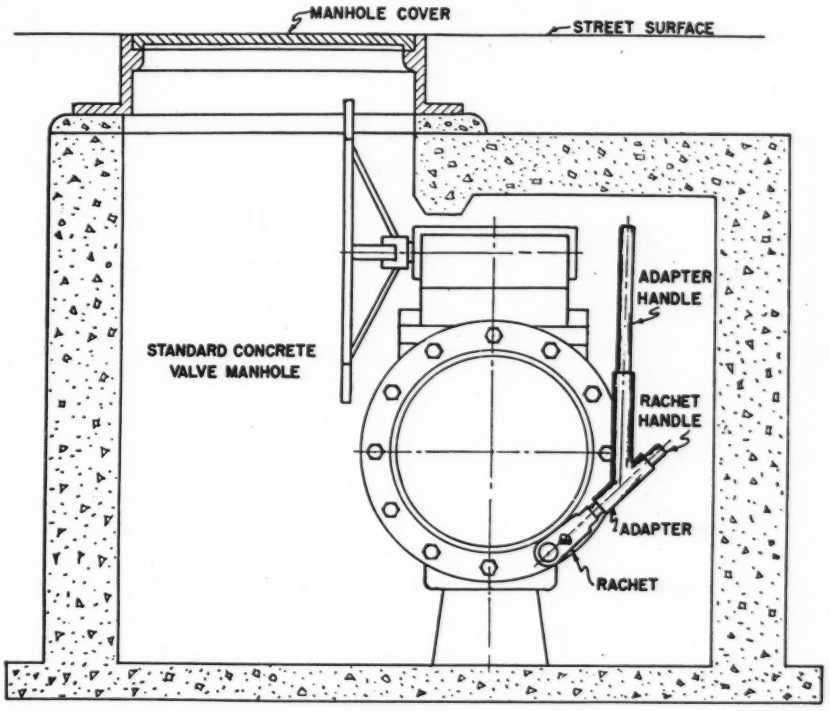
pany had constructed a 3-in. steel pipe in a 7-in. casing along the side of a highway bridge. The pipeline was about 54 ft long and was built 5 ft out from the side of the bridge 1 ft lower than the floor of the bridge. The accident occurred when an automobile drove off the side of the bridge and fell through the pipeline. Gas escaped and ignited, and two occupants of the car were seriously burned, one dying as a result thereof.

The company contended that it was not negligent at all and attempted to show practice in the industry which supported its method of construction. This evidence was excluded, since it could not be used to excuse negligence in the particular case. It was further held to be a question of fact for the jury whether the method of construction was negligent, and if so, whether the company should have anticipated the natural and ordinary consequences of its negligence. The jury determined these questions in favor of the plaintiffs and this action was sustained.

The next two cases,[18] *Haworth v. Southern Counties Gas Co.* and *Brunig v. Pacific Gas & Electric Co.*, relate to the type of ground in which you place your mains. In the Haworth case, Southern Counties had laid a main in filled ground in the San Pedro harbor area. Haworth was operating a locomotive crane, excavating sand and soil from the bottom of the channel nearby and depositing it on the landward side of a rubble wall. The weight of the crane passing over the main broke the main, there was an explosion, and Haworth was injured. The negligence complained of was that the company had not properly supported its pipeline and had insufficiently welded the joints. It was Haworth's contention that the company should have known that heavy machinery and heavy loads would be placed upon the ground under which the line was laid. The court sustained the judgment for the plaintiff, saying:

> The law requires of a gas company that it shall use reasonable and proper care, under all circumstances, in selecting its pipe, in laying its pipe, in taking care of it afterward, looking after it—and this question of reasonable and proper care has reference, of course, to the kind of instrumentality that it was dealing with and to the possible or probable consequences of neglect on its part.

The Brunig case occurred in San Francisco in the Butchertown district, which was built on filled-in marsh lands. PG&E's pipes were laid prior to 1908. In 1931 settling of a sidewalk broke a service pipe coupling, and an explosion occurred. It is true that in this case there had been a number of complaints of gas in the immediate area. The court said that whether or not there was negligence was a question of fact for the jury. The jury resolved this question against the company.



One of the most difficult tasks a gasman must perform when working in the cramped quarters of some concrete valve manholes, that of removing large nuts from valve flange bolts, has been solved by engineers of the Philadelphia Gas Works Co.

Nuts running up to 2 in. in diameter, especially those which had not been removed for long periods, were so difficult to remove that sometimes it was necessary to break out one wall of the manhole in order to get the proper leverage on standard wrenches. With the ratchet wrench adapter shown above, the difficulty has now been overcome. Inventors were, according to the PGW *News*, Ralph Jackson, Felix Adamczyk, and Albert Zehel.

It seems fairly obvious that if the company installs or permits the use of defective pipes, meters, connections, and couplings, there is a strong likelihood that it will be held liable if there is an explosion in the area. This was the result in *Linforth v. San Francisco Gas & Electric Co.*[19]

The case of *Chutuk v. Southern Counties Gas Co.*[20] seems to demonstrate the perils involved in system maps. The explosion there occurred in a sewer manhole. It seemed to be conceded that the leak of gas occurred at the connection of the company's main with one of its service pipes which was no longer in use. The company had recently reconditioned its lines in the area and found this joint to be in good condition.

The service appeared to have been hit by a trenching machine at some distance from the connection, however, and the company claimed that the plaintiff's employees were responsible. The plaintiff denied that his employees had struck the pipe, and further showed that the company had marked the location of pipes in the street, but failed to mark the location of this particular service. In the particular case the burden was on the company to show freedom from negligence, and with such a conflict in the evidence, the court found that the company had not sustained this burden.

Having covered cases involving liability in construction and maintenance operations on lines, next month we will discuss some of the decisions relating to the supply of service to the customers' premises.

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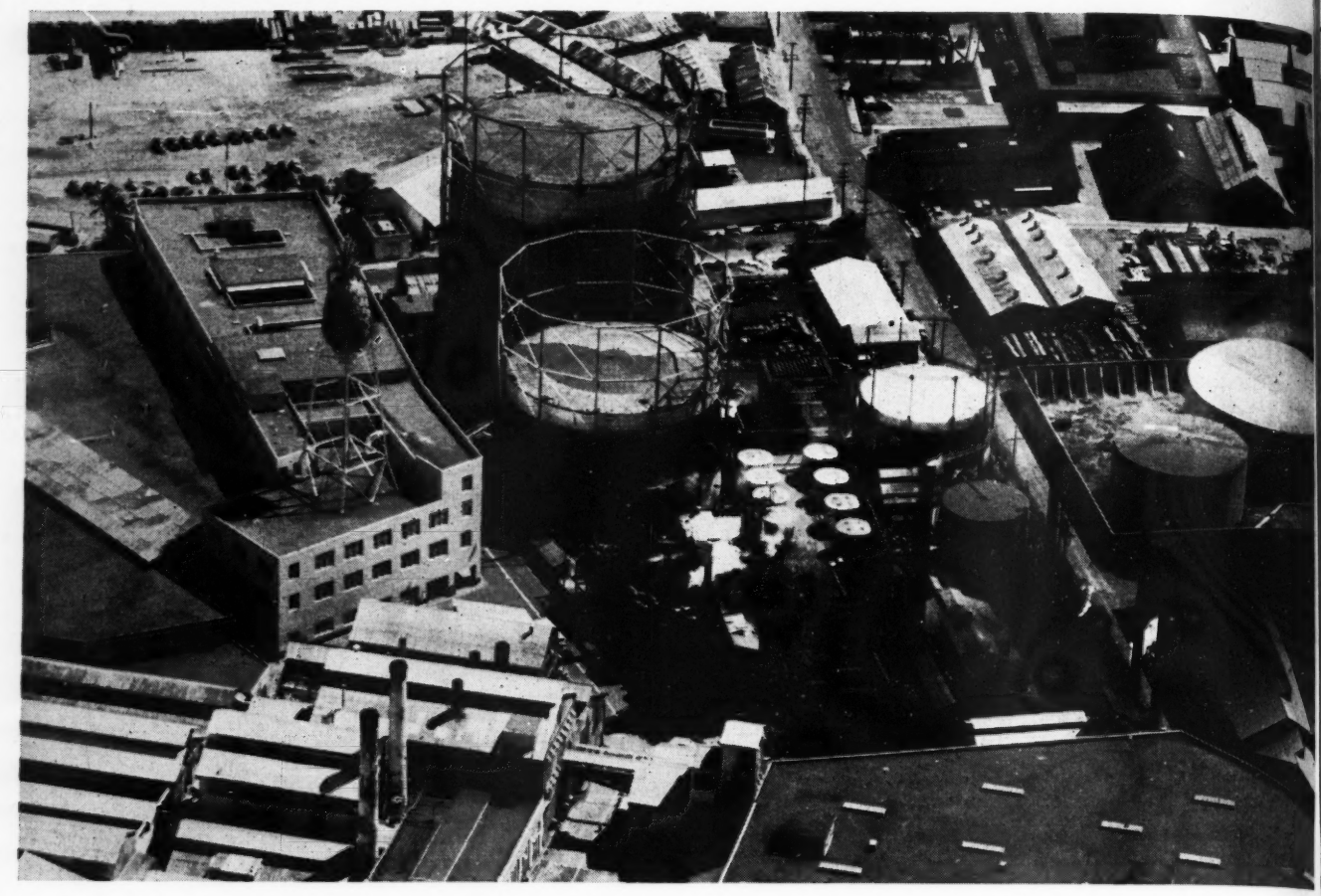
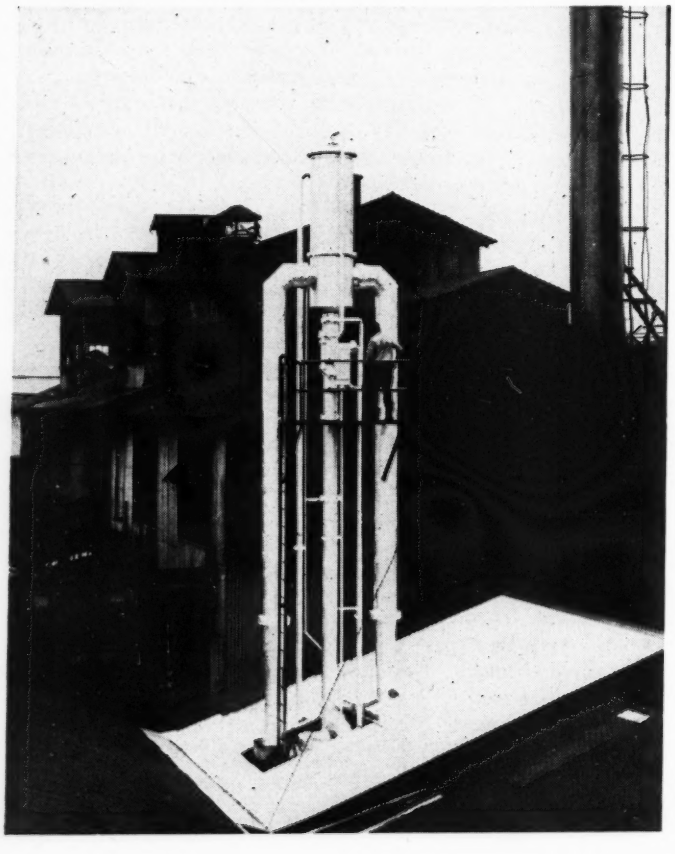
11. 6 Cal. Jur. Supp. 241.
12. 10 Cal. Jur. 183-5.
13. 19 Cal. Jur. 581.
14. Restatement, Torts, Sections 284, 289, 291.
15. Stats. 1915, Page 115; Deering's Ant. 6386.
16. Effective July 1, 1932. Authorized by Decision No. 24827.
17. Carroll v. Central Counties Gas Co., 96 Cal. App. 161. 273 Pac. 875.
18. Haworth v. Southern Counties Gas Co., 202 Cal. 714, 262 Pac. 313; Brunig v. Pacific Gas & Electric Co., 140 Cal. App. 254, 35 Pac. 2d 226.
19. Linforth v. S. F. Gas & Electric Co., 156 Cal. 58, 103 Pac. 320, 19 Ann. Cas. 1230.
20. Chutuk v. Southern Counties Gas Co., 21 Cal. 2d 372, 132 Pac. 2d 193.

(To be continued)



ABOVE: Air view of Honolulu Gas Co.'s plant.

BELOW: Steam-jet water vapor refrigeration unit is 51 ft high and upper section extends through roof of utility building. Floor space of 6 ft 3 in. x 9 ft is required.



Cooling Gas to Halt Corrosion

By HAROLD P. SAUERESSIG

Condensation in the distribution system was causing widespread corrosion in 1949 when Honolulu Gas Co. decided to take steps to cut the moisture content of the gas. Cooling by water vapor refrigeration was selected as the method of keeping the gas dry. This description of the system selected is adapted, with permission, from an article in the May 1951 issue of "Compressed Air." Mr. Saueressig was, until recently, plant superintendent of Honolulu Gas Co.

WITH about 300 employees and an annual payroll exceeding $1 million, Honolulu Gas Co. is a major factor in the business life of the Hawaiian community. Currently, it manufactures and delivers daily around 6.5 MMcf of 515-Btu gas made from heavy fuel oil in modernized Jones-type generators and conventional auxiliary equipment. The maximum sendout pressure is 50 psi. The transmission and distribution systems are made up of about 270 miles of piping ranging in diameter from 2- to 12-in.

A survey conducted in 1948 revealed stoppages in the distribution mains and customers' lines, regulators, meters, and appliances caused by iron-oxide dust resulting from corrosion. In 1949, as many as 31,000 complaints were received from the 36,000 consumers. Upon blowing the service lines, it was found that there was dust in 7600 of them and water in 1900. Combined, they represented about 26% of the lines investigated. In view of this finding it was decided to take steps to eliminate corrosion by reducing the moisture content of the gas sufficiently to prevent condensation in the distribution system.

Up to that time the gas that entered the transmission mains was being cooled to only approximately 90° F by passing it through two conventional aftercoolers operating in parallel. Semi-brackish water at 72° F was used for this purpose and was discharged from the aftercoolers into a finger-coral formation that lies just below ground level and extends to the ocean. Being extremely porous, this material offered a convenient means of disposing of the once-through cooling water.

Soil Temperature Survey

A survey of the city's soil temperatures showed minimum figures of 62° to 64° F. Plans were consequently made to provide facilities that would maintain the maximum gas dew point at 2° below the minimum ground temperature at the transmission and distribution pressures of 45 psig and 20 psig, respectively. Since Honolulu atmospheric temperatures drop below ground temperatures only occasionally, it was believed that the latter could be considered the controlling factor in determining maximum permissible gas dew points.

After these conditions had been established, an investigation of the various means by which the gas might be dried was undertaken. Findings indicated that cooling would be the most economical method for the moderate range required. This called for some kind of refrigeration equipment, and a steam-jet water-vapor unit was selected for the following reasons: exhaust steam was available at 10 psig; existing cooling-water systems could be easily altered to permit series flow through the refrigeration equipment; and apparatus of this type needed the least amount of floor space.

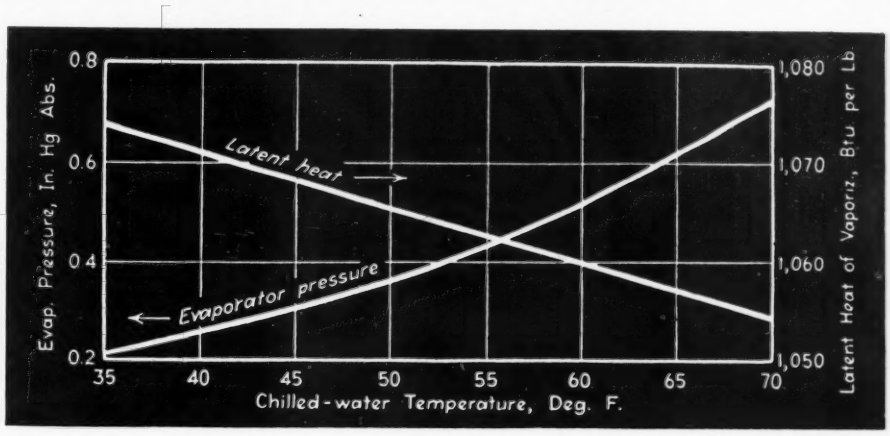


Fig. 1. Chart shows how chilled-water temperatures decrease as the degree of vacuum in the evaporator increases and indicates Btu's of latent heat removed per pound of water evaporated under varying conditions.

Aftercoolers Retained

In order to utilize existing facilities and thereby keep down the investment, it was decided to retain the aftercoolers and use the refrigeration unit to supplement the work they were doing. Thus, under the new arrangement, the old aftercoolers function as before to cool the gas with raw water to 90° F and the new equipment completes cooling to the final temperature of 55° with chilled water that is circulated through two additional aftercoolers. This has the further desirable effect of limiting the load on the refrigeration system.

The steam-jet refrigeration equipment is of the Ingersoll-Rand type and has a rating of 60 frame tons, which means that it will produce 60 tons of refrigeration per day when cooling water to 50° F. As applied to the service concerned, it is designed to chill 75 gpm of water to 45° and return it to the evaporator at 61.3°. The installation was completed in January 1950, and tests conducted since then have shown that the capacity and performance requirements have been exceeded.

Steam-jet Operating Cycle

The operating cycle of steam-jet refrigeration units is similar to that of a vapor-compression system using a chemical refrigerant, except that the physical properties of water are such as to keep the pressures involved below atmospheric pressure. A further difference is that the water evaporated to produce the refrigeration effect is not normally recirculated.

In a system of this type, water, the only refrigerant used, is introduced into an insulated chamber in which sufficient vacuum is maintained to cause some of it to evaporate. It is not possible for water to remain liquid if the pressure on it is reduced to less than its vapor pressure at the existing temperature, as shown in *Fig. 1*. The latent heat for the water that evaporates is furnished by the remaining water, which is cooled in the process. Vacuum is maintained by a suitable combination of steam-jet ejectors and condensers. In the installation under discussion, the main condenser is of the barometric type.

Heat Removal Rate

Since each pound of water evaporated extracts in excess of 1000 Btu's of latent heat, a corresponding number of Btu's of sensible heat will be removed from the remaining water, which means that 100 lbs, for example, will be cooled approximately 10° F. Because each "ton" of refrigeration produced by any sort of refrigeration system means the extraction of 12,000 Btu per hour, it is evident that the evaporation of slightly less than 12 lbs of water per hour is equivalent to one ton of refrigeration. The evaporator temperature maintained depends, of course, upon the vacuum maintained, and this, in turn, upon the work accomplished by the ejector-condenser installation. The only utilities required to operate such a system are steam for the ejectors, cooling water for the condensers, and steam or electricity for the cold-water and condenser-water pumps.

By using the exhaust from the steam-driven compressors that send the gas out from the plant, the Honolulu Gas Co. obtains up to 2030 lbs/hr of steam at 5 psig pressure to supply the jets that maintain vacuum in the evaporator. In addition, up to 200 lbs/hr of steam at 140 psig is furnished the ejectors that

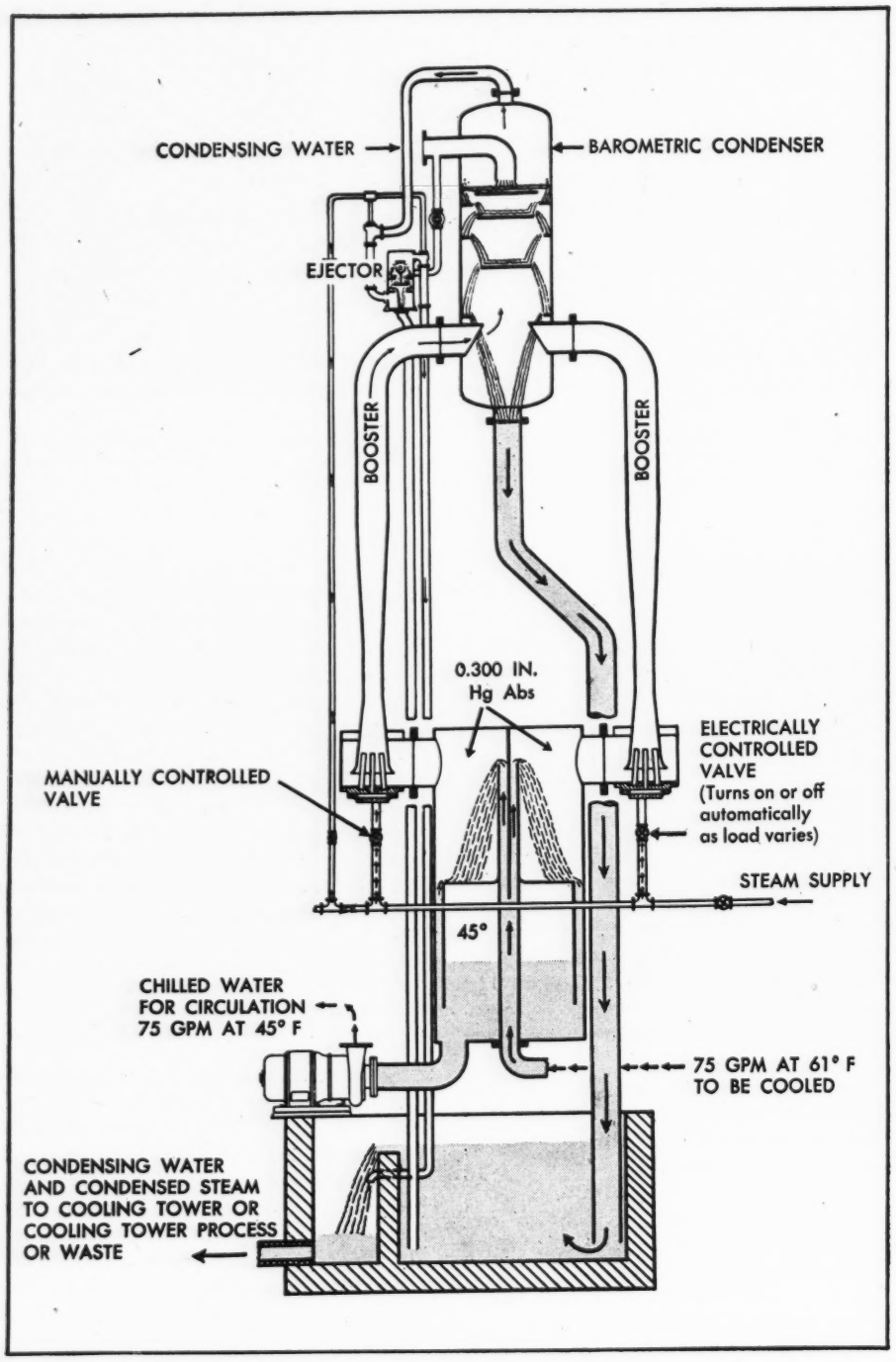


Fig. 2. Working diagram of water-vapor unit. One of the two boosters is always in operation, as shown. When the demand for chilled water increases, the second booster is automatically brought into action.

remove incondensibles from the system. Process water that was already available serves to condense the steam, most of which is done in the condenser that is an integral part of the refrigeration unit. As the water is brackish, the barometric condenser, including its tail pipe, is built of cast iron to better withstand the corrosive action of the salty fluid.

Inasmuch as the refrigeration unit is equipped by the manufacturer to operate automatically, it is a relatively simple matter to regulate the final temperature of the gas. As *Fig. 2* shows, two steam-jet ejectors or boosters are provided to induce vacuum in the evaporator, and either one or both may be utilized, depending upon load conditions. One booster is manually controlled, while the other one is equipped with a motor-powered valve to admit steam according to service requirements. Both are operated either "all on" or "all off."

When the unit is running at more than half load, the manually controlled booster is in continuous service, and the second one is called upon only when it is needed. Through a thermostat, immersed in the chilled water of the evaporator, the valve that brings the second booster into action is actuated whenever the temperature of the water rises above a set point. Conversely, it will shut off the steam supply whenever the water temperature falls below that point. When the load is such that the refrigeration unit is running at less than half capacity, the hand-controlled booster is shut down and the motor-controlled one remains in service. The temperature of the water can be maintained within 2° F of the established point under any operating condition within the capacity of the unit.

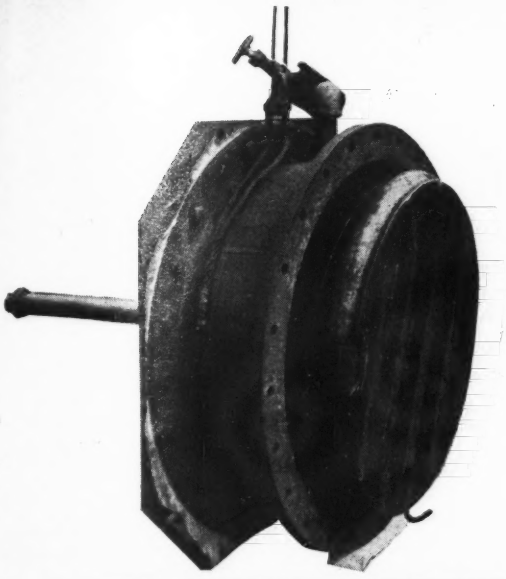
Economies Expected

Because the chilled water is returned to the evaporator after passing through the aftercoolers, the circuit is a closed one, except for the addition of enough water to the evaporator to compensate for that lost through evaporation and removal. The quantity supplied the aftercoolers is regulated by means of temperature controllers that have their indicating elements in the departing gas stream. It varies widely, inasmuch as the gas sendout per hour ranges from less than 100 Mcf in the morning to around 500 Mcf during the evening peak period.

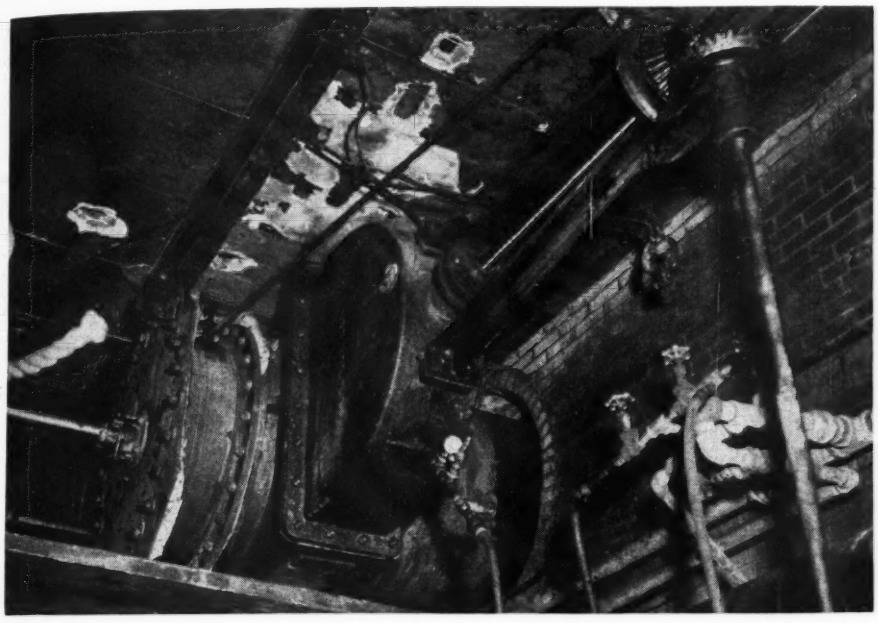
It is expected that numerous economies and benefits will result from the supplemental cooling of the gas. A marked change in the character of the corrosion products removed from the mains was noticed soon after the new facilities were placed in operation. In some parts of the city, where the dust previously contained enough moisture to give it a damp appearance, it is now dry and can be easily blown out of the pipes. Also, water has virtually disappeared from service lines.

Better Customer Relations

With moisture excluded from the mains, it will no longer be necessary to blow consumers' lines, as was the practice when the visit of a serviceman was requested. Neither will it be necessary regularly to check the 21 moisture drips located at various points in the distribution system. Consequently, worthwhile savings in labor costs seem certain. Further, relations with customers will be improved because of a reduction in the frequency with which appliances will have to be adjusted, changes made in regulators and meters, and servicemen dispatched to attend to matters that have normally meant interrupting the gas supply.



Home-Made Stopper Permits Valve Removal and Repair



TOP: Closeup of stopper shows rubber tube which, when squeezed, expands inside pipe, stops gas flow.

LOWER: Home-made gas stopper which closed 36-in. main inlet valves while repairs were being made is shown in place.

REMOVAL of gas valves for repair from a live line where no by-pass was afforded was recently accomplished by Consolidated Edison Co. of New York. An ingenious home-made stopper, fabricated by personnel in the production department at the Hunts Point plant, turned the trick.

The job was done on the 36-in. diameter main inlet gas valves on the oven gas exhausters. The operating stems on three of these gas valves were badly corroded. They could not be removed for repair, however, because they are installed in the main gas stream of the coke ovens and there are no by-pass mains or other means to isolate the valves from the plant.

After careful planning, a home-made gas stopper was constructed from two ⅜-in. plates, 34½ in. in diameter and ribbed for reinforcement. One plate was fastened to an 8-ft piece of 2½-in. extra heavy pipe and the other plate to a 1½-in. bar about 9 ft long. The plates were fitted together by inserting the bar through the pipe and were held together with a bolt and washer at the end of the bar.

Between the plates and extending slightly beyond them, like an over-filled sandwich, was mounted a special circular rubber tube like that for an auto tire. Made of ½-in. thick rubber, it was 4 in. in diameter and 34¾ in. in outside diameter. The entire assembly was made to fit inside a 36-in. pipe. By tightening the bolt on the bar, the plates compressed the rubber tube, causing it to expand outward against the inside wall of the 36-in. pipe, thus sealing off the opening in the pipe.

In order to be able to insert the stopper in a "live" gas main, the 36-in. flanged spoolpiece seen in the smaller picture was built to hold the stopper. One end of the spoolpiece is blanked and has a center gland to allow the 2½-in. pipe shaft of the stopper to pass through.

Since the exhauster valves to be repaired were located in a vital part of the coke oven plant, it was essential that the repair job, once started, would proceed to completion without meeting any unforeseen difficulty. It would have been a serious matter if a detail had been overlooked so that the stopper jammed in the valve in such a manner that it could not be removed.

To make sure that the job would proceed as planned, the entire procedure was carefully rehearsed on a spare 36-in. valve, of the same type, set up in the shop. This simulated repair showed the need for important structural changes to the stopper before it would work to the complete satisfaction of Hunts Point men.

When every possible contingency had been anticipated, the actual job was started. The oven gas exhauster inlet valve was closed and a piece of 36-in. pipe between the valve and the exhauster was removed. The special 36-in. spoolpiece, with the stopper in it, was fastened to the end of the closed valve as seen in the picture above. The valve was then fully opened and the stopper slid through the open valve gates and into the far flange of the valve.

The stopper was then expanded against the inside wall of the valve flange and this effectively sealed off the flow of gas to the valve body. The valve bonnet, valve gates, and stem were removed and the new gates and stem were installed. The stopper was then contracted and pulled back into the spoolpiece. The newly repaired valve was closed and the job was complete.

Presented through the courtesy of *Around the System*, employee publication of Consolidated Edison Co. of New York Inc.

Acceptance Tests for LP-Gas For City Gas Plants

By C. S. SPENCER
Michigan Consolidated Gas Co., Detroit

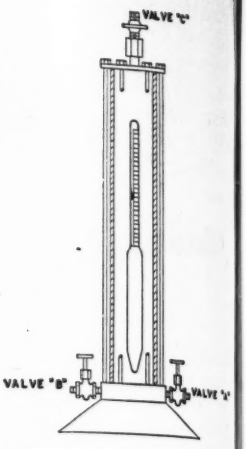


Fig. 1. Pressure hydrometer jar for specific gravity of LP-Gas.

LIQUEFIED petroleum gases, an important source of fuel throughout the country, are gaseous at atmospheric temperatures and pressures, but are easily liquefied by moderate pressure. The material is handled in the liquid form. Commercial LP-Gas from natural gasoline or recycling operation may range in composition from nearly pure propane to nearly pure butane, or mixtures of varying proportion of the two with the possibility of additional amounts of isobutane, ethane, and pentane. Refinery LP-Gas may also, in addition to these compounds, contain certain unsaturated hydrocarbons.

With the increased use of LP-Gas in the gas industry, the sampling and testing of the materials becomes increasingly more important. Proper inspection is especially important if more than one type of LP-Gas is received with the possibility of mixing in storage. Only those tests which are of primary interest to operating personnel as a means of identifying shipments or for the control of processing will be discussed. These tests are simple enough for operating personnel to perform and are of sufficient accuracy for acceptance or identification purposes.

The Natural Gasoline Assn. of America has collected and published a number of the test methods for LP-Gas and their specifications should be followed as closely as possible. Committee D-2 of the ASTM has under consideration proposed standards for the sampling of these light hydrocarbons.

Before discussing the sampling and testing of LP-Gas, the safety measures incident to these procedures should be reviewed. With the proper precautions it may be handled safely, but carelessness will surely lead to accidents. The operating personnel should be thoroughly instructed in the behavior of these materials and the necessary precautions to be taken.

First in importance is that contact of the liquid or expanding gases with the skin must be avoided. Due to the rapid evaporation with accompanying chilling, severe freezing of tissue may result from contact with the liquid. Under no circumstances should woolen or cotton gloves be worn as a spill of liquid on these will invariably result in burns. Neoprene-coated gloves are the only permissible type of gloves that should be worn.

Wool clothing will absorb the vapors and hold them for a considerable length of time. An operator who has come in contact with the vapors may come into a warm room, and an open flame may ignite the vapors clinging to clothing.

When working with LP-Gas it must always be remembered that the vapors are heavier than air and will carry along the ground for long distances with little diffusion. Any spark will cause a flashback and possibly a serious fire.

Sampling

As the sampling of receipts of LP-Gas is made on arrival of the tank car, the gauging of the car may well be made a part of the sampling procedure. This procedure is covered by ASTM D-1085.

1. Remove plug from thermometer well and lower thermometer to bottom of the well and allow to remain for at least 10 minutes. Raise thermometer quickly and read at once. Return thermometer to well for a check reading. Record temperature.

2. Release slip tube lock and raise the slip tube until the 6-in. mark is opposite the index pointer. The slip tube may be forcibly ejected by the pressure in the container; therefore the operator should never lean over the tube but should stand clear. Open the valve slightly to prevent the excess flow valve from closing. Gas should now flow from the valve. If liquid appears, raise the tube until gas flows. Then lower the tube until liquid appears. Then raise ¼ in. at a time until gas reappears. Read the tube marking opposite the pointer and record reading. To check reading, lower the tube ¼ in. at which point liquid should flow from the tube. If it does not, the reading was in error and the operation must be repeated until a reading is found that can be checked.

From the tank outage thus determined and the temperature of the liquid, the contents received may be found from the outage tables supplied by the vendor.

Because of the many variations in the construction of LP-Gas containers and handling systems, explicit directions for sampling cannot be specified. A few general observations as to sampling may be made. Sampling is complicated by the necessity of working under pressures which may be near or even below atmospheric for butane in the winter months, or near 200 psi for propane in the summer months. Only samples of the liquid shall be taken to obtain a representative sample, especially if the liquid is known to be a mixture.

The most satisfactory sampling connection is the high pressure hose used in the lubrication of motor vehicles. Short lengths of ¼-in. OD copper tubing brazed to the hose fittings will allow the use of flared connectors, and with the proper adaptors and bushings connection to any size opening is an easy matter. The sampling connections may be made of copper or aluminum tubing but such tubing has the disadvantage of being too rigid for easy

This paper was presented at the AGA Production & Chemical Conference in New York, May 14-16.

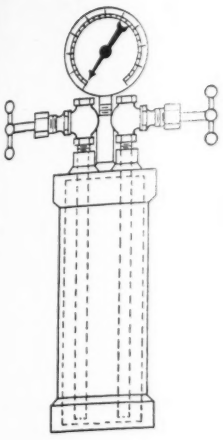


Fig. 2. Vapor pressure bomb for LP-Gas.

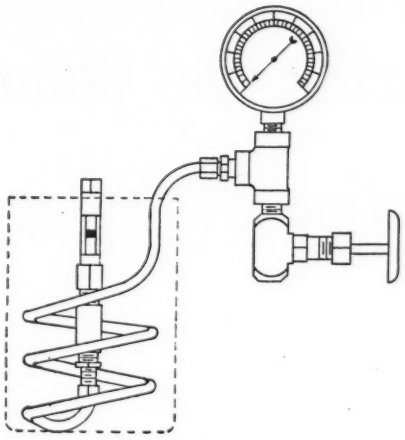


Fig. 3. Cobalt bromide test for moisture in LP-Gas.

manipulation. Sample containers may be of any material which has a working pressure of at least 250 psi. These containers may have either one valve or an inlet and outlet valve. Two valves are more satisfactory as they allow better purging.

Specific Gravity

For the routine testing of LP-Gas gravity, the hydrometer method of the NGAA is the most practical as normally it will give sufficient accurate information for acceptance or rejection.

Equipment: Pressure hydrometer jar, *Fig. 1*, as specified by NGAA, a combination hydrometer and thermometer, with a range of 0.500 to 0.650 and suitable connections for obtaining the sample.

Procedure: Purge the hydrometer jar by opening the vapor outlet valve C and the inlet valve A. Fill the jar nearly to the top with liquid and close the inlet valve. Allow the liquid to boil for a few seconds to displace any air above the liquid. Close the vapor valve and empty the jar by opening the outlet valve B. Close the outlet valve and slowly open the inlet valve A and fill the jar until the hydrometer floats freely. The hydrometer is read to the nearest one-thousandth and the temperature of the liquid is noted. The specific gravity is then corrected to 60°F/60°F by the use of the standard tables.

If the liquid fails to flow into the hydrometer jar due to pressure conditions, cautious venting of the jar by opening the vapor outlet valve will allow the liquid to enter. Only enough vapor should be released to admit liquid to float the hydrometer. In a mixture, excess venting may allow some of the lighter constituents to boil off and give a false specific gravity.

When propane is being sampled in the summer months, some difficulty may be encountered due to excessive pressure in the hydrometer jar causing the hydrometer bulb to be crushed. If several small portions of the liquid propane are allowed to evaporate freely in the jar by opening the vapor outlet valve, the apparatus is chilled sufficiently to keep the liquid cool until a reading may be obtained. A pressure gauge installed in a tee at the vapor outlet valve will allow the operator to maintain a safe pressure when sampling liquid of high vapor pressure.

Vapor Pressure

Equipment; Vapor pressure bomb, *Fig. 2*, as specified by the NGAA. Water bath capable of maintaining a temperature of 80° F, 100° F, and 105° F constant to within ±0.2° F.

Procedure: The bomb is purged of air and vapors from previous tests by connecting to the source of supply and completely filling with liquid. The inlet valve is closed and with the bomb in an inverted position, the greater part of the liquid is allowed to boil off by opening the outlet valve. When most of the liquid has boiled away, the bomb is placed in an upright position whereupon the residual liquid will be discharged through the eduction tube. The bomb, now containing vapor only, is completely filled by closing the discharge valve and opening the inlet valve. As soon as the bomb gauge registers the pressure of the source of supply the valve is closed and the bomb disconnected. Sufficient outage is immediately provided by withdrawing into a graduated cylinder a volume of liquid equal to 20% of the volume of the bomb (approximately 140 ml). With very volatile materials the outage may be determined by weight instead of by volume.

The bomb is shaken several times and immersed in the water bath to 1 in. above the top of the collar. Temperature is maintained at 80° F for five minutes, and the bomb is removed from the bath and shaken vigorously. The bomb is returned to the bath for five minutes when it is again removed and shaken. This is repeated for a period of 20 minutes or until there is no further change in the gauge reading. This pressure is then recorded as the vapor pressure at 80° F.

The temperature is then raised to 100°F±0.2°F and the procedure repeated, recording the vapor pressure. The same procedure is again repeated for a bath temperature of 105° F.

Moisture

Equipment: The cobalt bromide apparatus, *Fig. 3*, as specified by the NGAA is used.

Procedure: The apparatus is assembled with the indicator tube in place. The cooling coil is placed in an ice water bath. The apparatus is connected to the source of vapor and the needle valve adjusted to hold exactly 50 psi. This pressure is maintained for a period of 30 minutes. If the color of the indicator remains blue, the material is reported as being dry, and if the final color is pink or lavender the material is reported as being wet.

To check the results, and to eliminate the possibility of free moisture in the tubing connection, the pressure is reduced to 5 psi. If no water is present, the indicator will rapidly resume a blue color. If the indicator remains pink there is water present in the fittings, which should then be dried out and the test repeated.

Hydrogen Sulfide

Equipment: Silver cyanide tubes are prepared by placing a 5-cm column of silver cyanide in a 10-cm length of 7-mm glass tubing and plugging the ends with glass wool.

Procedure: Pass the vapor through the tube at a slow rate for a period of 30 minutes. The waste gas may be burned if desired. In the presence of hydrogen sulfide the silver cyanide is darkened. The hydrogen sulfide test is reported as faint, medium, heavy, or none depending on the color of the tube. Mercaptan odorants added to the liquid cause no discoloration of the silver cyanide.

These are the tests which are of prime interest to operating personnel. Other tests, such as the open cylinder weathering test, the mercury freezing test, weighed specific gravity test, and total sulfur test are laboratory procedures and are not necessarily a part of field testing. The details of these methods may be obtained from the Standards of the Natural Gasoline Assn. of America.

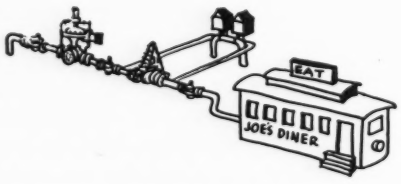
Criteria for Selecting the Optimum Design For a Distribution Regulator Station

By H. M. McCAMISH

PART II

In this second and concluding installment, Mr. McCamish considers the 10th requirement involved in good regulator station design and proceeds to apply the 10 criteria to specific cases. Herein he evaluates three stations—two theoretical designs and one actual installation.

10-MINIMUM COST



Up to now, the various requirements have been listed which are involved in good design. The design engineer's responsibility includes the investigation of new or alternate methods or equipment which will provide the same service at a lower cost. A design for a station which satisfies the nine requirements listed above is still not the "best design" if the cost is greater than it need be.

The only way to design for the greatest economy is to have a thorough knowledge of the methods and equipment available. For the engineer involved in the design of regulator stations, this requires that he acquaint himself with the possibilities and limitations of many models of regulators, filters, separators, valves, couplings, pipe fittings, and pipe fabrication. In addition to this, he should be familiar with reinforced concrete design. Finally, he should be aware of the functions which will be involved in the operation and maintenance of the regulator station and should acquire a knowledge of the triumphs and failure of his predecessors. Only with this fund of information can the design engineer hope to achieve the maximum in design at a minimum cost.

LET us now see how the 10 requirements we have set up can be applied to specific cases. The purpose in doing this is merely to indicate how the requirements may be utilized to compare alternate designs and further to illustrate the use of "pressure profiles" for comparison or evaluation.

The first type of station to be discussed is a large, district regulator station. This type of station is intended for highly built up areas and therefore must be designed for construction in a pit. Two versions have been drawn up, the first, Station "A" *(Fig. 5)*, being very generally used, and the second, Station "B" *(Fig. 6)*, being an alternate design. I consider the alternate design to be superior and, although there is no absolute scale for measuring the relative merits of the two, I believe *Table 1* gives a fair comparison which justifies my choice.

Most of the comparisons are obvious but one or two probably should be explained. Station A is rated lower than Station B on work accessibility because the lower regulator is so close to the ground and also because of added difficulty in installing and removing this lower regulator with its location below the upper piping.

As for the number of types of fittings (under the minimum cost requirement), I believe that a large number of different fittings in a regulator station indicates that the design was not examined for possible simplifications. The use of a large variety of fittings in regulator station construction requires that a large stock of fittings be kept on hand, or if a complete stock isn't kept, delays which reduce efficiency will result.

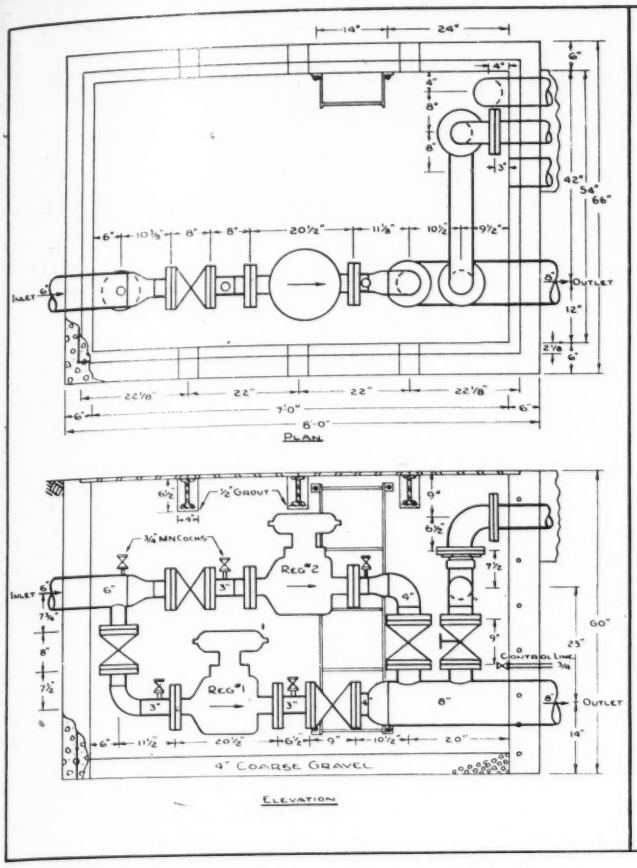
The 45° turns and entrances used in Station B not only produce less pressure drop than 90° configurations, but this type of arrangement reduces the load-shifting tendencies produced by "head-on" entrances to the header.

To make the comparison absolutely fair, it was assumed that the relief valving which was in Station A was necessary and it was included in Station B. Actually it would appear very doubtful that relief valving on this station is necessary, as it was designed for regulation from 60 to 10 lb and there is the safety factor of regulators at each customer's meter. Leaving the relief valving out would allow a pit of smaller area, reduce piping costs, and allow the horizontal piping to be raised further above the floor.

There are two disadvantages to Station A which are not covered by the comparison. One is the fact that the

TABLE 1. COMPARISON ON BASIS OF 10 REQUIREMENTS

	REQUIREMENT	STATION "A"	STATION "B"
1.	Pressure Regulation	----------Identical----------	
2.	Continuing Proper Pressure Regulation	----------Identical----------	
3.	Service Continuity	----------Identical----------	
4.	Protection from Traffic		
	Cover Strength	Good	Good
5.	Min. Hazard to Public	----------Identical----------	
6.	Min. Hazard to Personnel		
	Min. Depth	Good (56")	Very Good (48")
	Max. Percentage Opening	100%	100%
	Min. Weight Cover	Very Good (78#/Sect.)	Good (94#/Sect.)
7.	Operating and Maint.		
	Working Space	Very Good	Very Good
	Work Accessibility	Good	Very Good
	Ease of Opening	Good	Good
8.	Min. Space Occupied	Good (8' x 5.5')	Very Good (6.25' x 6.5')
9.	Outward Appearance	----------Identical----------	
10.	Min. Cost		
	Min. Types of Fittings	Good (16)	Very Good (12)
	Simple Fabrication	Very Good (18 Welds)	Very Good (19 Welds)
	Est. Cost (Total)	$1600	$1600
	Est. Cost (Exclusive of Regulators)	$1000	$1000



MATERIAL LIST
PIPING

Item	Quantity	Description
A	2	3" Emco HPBV regulator (11 diaphragm)
B	1	4" gate valve (200#)
C	2	4" #143 Nordstrom plug valve (200#)
D	2	3" #143 Nordstrom plug valve (200#)
E	1	A.C.F. relief valve with 150# threaded flange
F	6	8" 150# steel flanged nipple
G	1	4" x 3" welding reducer
H	1	4" x 3" - 150# welding reducing flange
I	1	4" - 125# C.I. flanged ell
J	2	4" welding ell 4" radius
K	2	3" - 300# weldneck flanges
L	2	3" - 300# steel flanged nipple (thread one)
M	4	3" - 150# steel flanged nipple
N	1	3" welding ell long radius
O	1	6" x 3" welding reducer
P	1	4" welding cup
Q	1	4" coupling (cut in half)
R	1	8" welding cup
	7	3/4" M.N. cock #1018
	6	3/4" plugs

PIT

2	3/8" x 1½ x 64 steel ladder ring
5	3/4" ∅ x 12" steel ladder rungs
300'	3/8" ∅ steel reinforcing rod
4	3/16" x 22" x 60" diamond plate
3½ cu yd	Ready mix concrete
½ cu yd	Coarse gravel

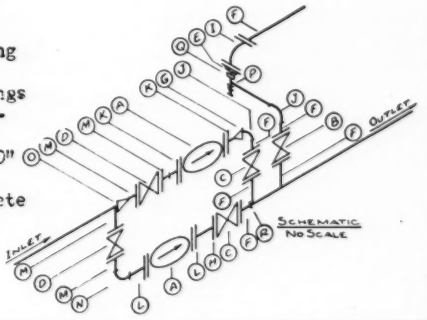
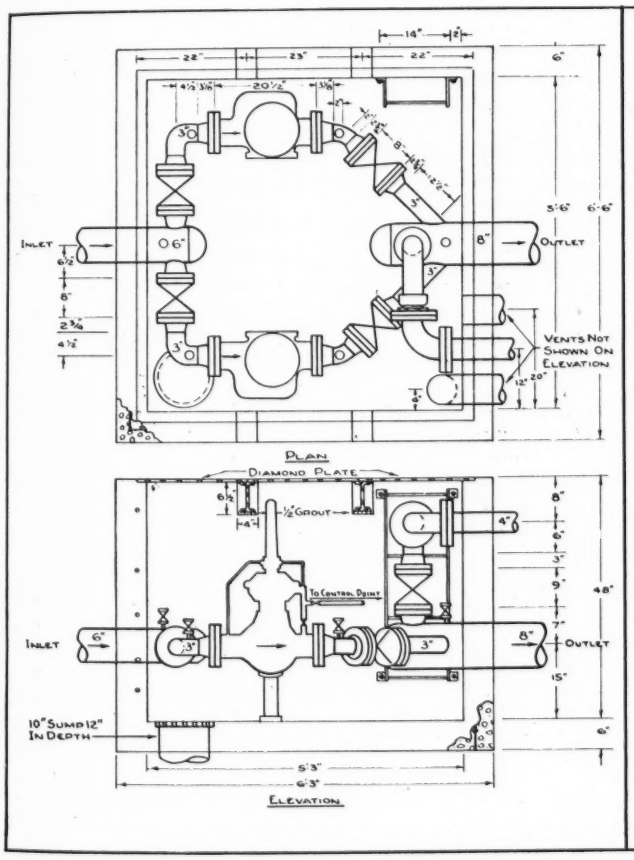


Fig. 5. Regulator Station A.



MATERIAL LIST
PIPING

Item	Quantity	Description
A	2	3" Emco HPBV regulator (11" diaphragm)
B	4	3" #143 Nordstrom plug valve (200#)
C	1	4" #115 Nordstrom plug valve (200#)
D	8	3" 150# weldneck flanges
E	4	3" 300# weldneck flanges
F	2	4" 150# weldneck flanges
G	1	6" welding cup
H	1	8" welding cup
I	2	3" 90° welding ell long radius
J	2	3" 45° welding ell long radius
K	1	4" coupling (cut in half)
L	1	4" 90° welding ell
M	1	4" C.I. flanged ell
N	1	4" steel flanged nipple
O	1	4" A.C.F. relief valve with 150# threaded flange
	6	1/4" x 2" nipple (TOE) with cap
	2	3" pipe regulator support with saddle

PIT

160'	3/8" ∅ steel reinforcing rod
3	3/16" x 22 1/4" x 70" diamond plate
2½ cu yd	Ready mix concrete
2	3/8" x ½" x 38" steel ladder rails
4	3/4" ∅ x 12" steel ladder rungs

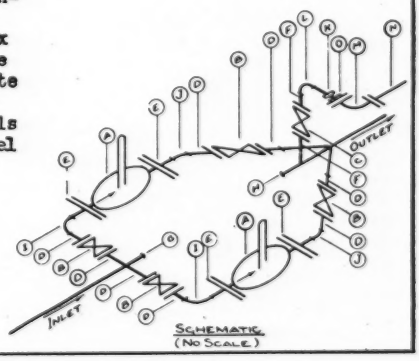


Fig. 6. Regulator Station B.

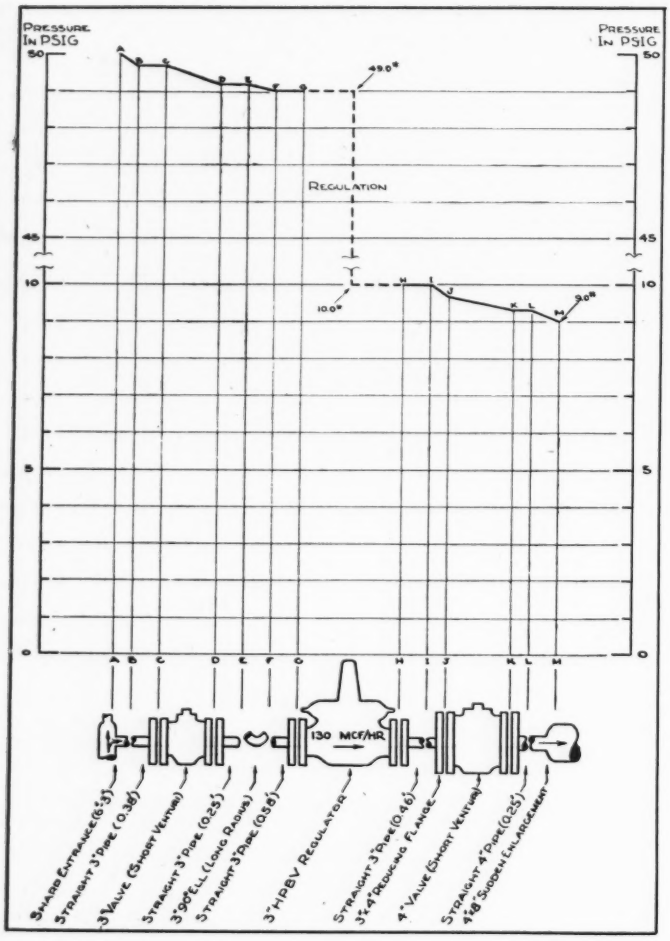


Fig. 7. Pressure profile, Regulator Station A.

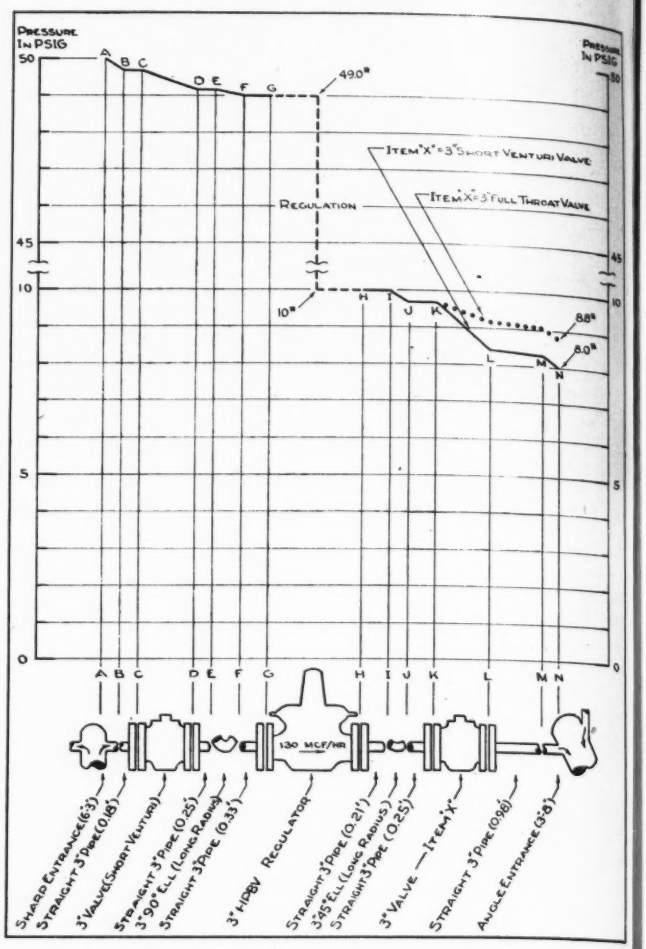


Fig. 8. Pressure profile, Regulator Station B.

pilot regulators (not shown on the drawing) are not mounted on the control regulators and consequently must be mounted elsewhere in the pit with the resulting increase in small piping. The other is the fact that the inlet and outlet pipes are at different levels, requiring a turn outside the pit to return to the proper level.

Pressure profiles of Stations A and B are shown in *Figs. 7* and *8*. The pressure drops shown on the graphs were calculated for full load conditions (see *Tables 2* and *3*), from gas flow formulas, the data for the most part being taken from the "Polyflo Flow Computer Manual."[1] This type of graph is intended as an aid in evaluating regulator station designs with respect to the pressure drop considerations, particularly for comparative purposes. As

TABLE 2. REGULATOR STATION "A" - CALCULATED FULL LOAD PRESSURE DROPS

(1) Point	(2) Item	(3) Velocity Heads (a) F	(4) Equiv. Length of 3" Pipe L	(5) Pressure Drop* Δ P	(6) Pressure P
A					50#
B	6" - 3" Sharp Entrance	0.47	7.2	0.3#	49.7
C	Straight 3" Pipe (0.38')	Negl	0.4	Negl	49.7
D	3" Valve (Short Venturi)	0.77	11.8(j)	0.5	49.2
E	Straight 3" Pipe (0.25')	Negl	0.2	Negl	49.2
F	3" 90° Ell (Long Radius)	0.27	4.2	0.2	49.0
G	Straight 3" Pipe (0.58')	Negl	0.6	Negl	49.0
← Reg →	3" HPBV Regulator				
H					10#
I	Straight 3" Pipe (0.46')	Negl	0.5	Negl	10.0
J	3" x 4" Reducing Flange	0.17	2.7	0.3#	9.7
K	4" Valve (Short Venturi)	0.24	4.6(j)	0.4	9.3
L	Straight 4" Pipe (0.25')	Negl	0.2	Negl	9.3
M	4" x 8" Sudden Enlargement	0.55	2.8	0.3	9.0

* For 3-in. pipe, L=15.3F (at 130 Mcf/hr/reg) ** At a load of 130 Mcf/hr (a)
For 4-in. pipe, L=19.5F (at 130 Mcf/hr/reg)

TABLE 3. REGULATOR STATION "B" - CALCULATED FULL LOAD PRESSURE DROPS

(1) Point	(2) Item	(3) Velocity Heads(a) F	(4) Eq.Length 3" Pipe* L	(5) Pressure Drops* Δ P	(6) Pressure P
A					50.0#
B	6" x 3" Plenum to Pipe Entrance	0.48	7.3	0.3#	49.7
C	Straight 3" Pipe (0.18')	Negl	0.2	Negl	49.7
D	3" Valve (Short Venturi)	0.77	11.8(j)	0.5	49.2
E	Straight 3" Pipe (0.25')	Negl	0.2	Negl	49.2
F	3" 90° Ell (Long Radius,St.Wt.)	0.27	4.1	0.2	49.0
G	Straight 3" Pipe (0.33')	Negl	0.3	Negl	49.0
← Reg →	3" HPBV Regulator	-	-	39	
H					10.0
I	Straight 3" Pipe (0.21')	egl	0.2	Negl	10.0
J	3" 45° Ell (Long Radius,St.Wt.)	0.17	2.6	0.3	9.7
K	Straight 3" Pipe (0.25')	Negl	0.2	Negl	9.7
L	3" Valve (Short Venturi)	0.77	11.8(j)	1.3	8.4
M	Straight 3" Pipe (0.98')	0.06	1.0	0.1	8.3
N	3" x 8" 45° Angle Entrance	0.19	2.9	0.3	8.0
K1					9.7
L1	3" Valve (Full Throat)	0.27	4.2(j)	0.5#	9.2
M1	Straight 3" Pipe (0.98')	0.06	1.0	0.1	9.1
N1	3" x 8" 45° Angle Entrance	0.19	2.9	0.3	8.8

* For 3-in. pipe, L=15.3F (at 130 Mcf/hr/reg) ** At a load of 130 Mcf/hr (a)

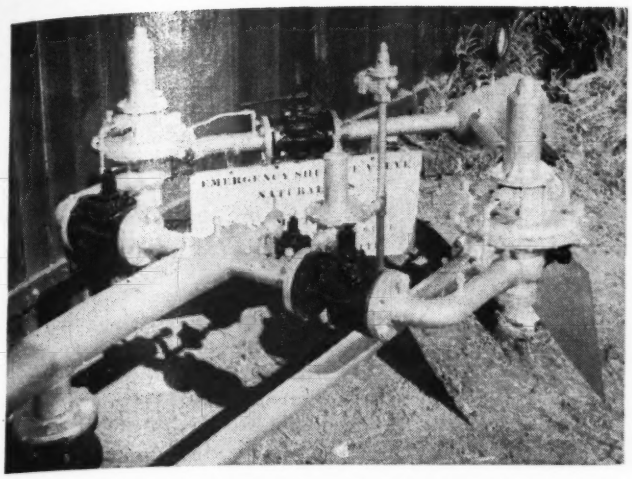


Fig. 9. Closeup of regulator arrangement in Regulator Station Y.

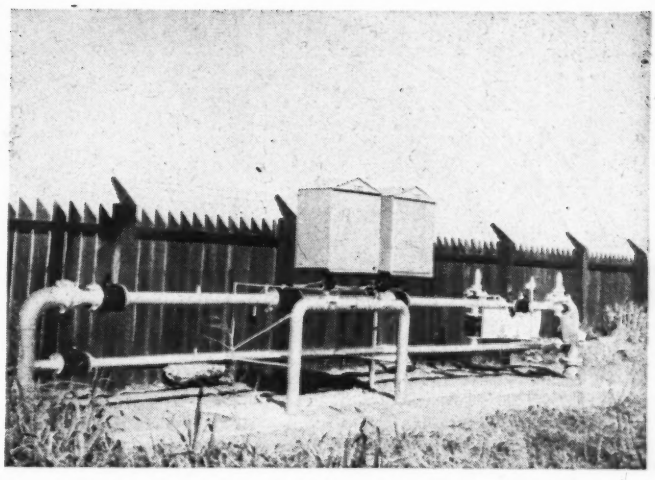


Fig. 10. View of Station Y showing orifice meter run upstream.

many configurations common in welding gas piping are not covered in the fluid flow literature, it has been necessary to utilize the data given for the most similar configuration shown. (The results of field test will be discussed under Regulator Station "Y").

As shown on the pressure profiles, Station A is a better design from a pressure drop standpoint than Station B. The substitution of full throat valves* in the downstream section of Station B would make it approximately equivalent to Station A with regard to pressure drop and would add a cost of only $30 to the station. There is no need to do this, however, as control at a remote point is being utilized.

Customer Regulator Station "Y" was designed for a maximum total load of 200 Mcf per hour (or 100 Mcf/regulator/hour). The total cost for the station was $1800. *Fig. 9* shows the regulating section of the station while *Fig. 10* includes the orifice meter run upstream of the regulators.

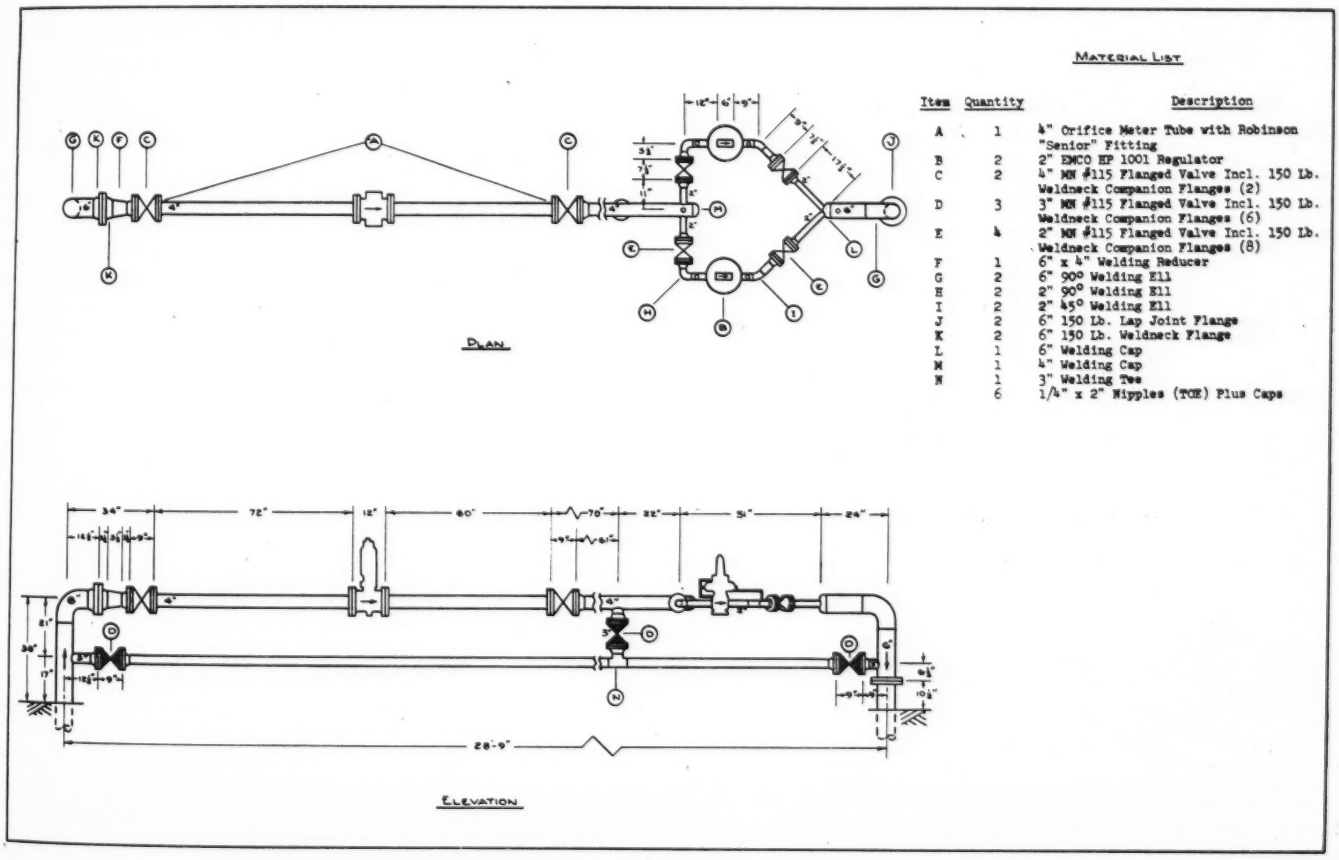
The small spring loaded regulator seen between the two pilot loaded regulators in *Fig. 9* was installed during the initial pilot plant runs performed at this plant previous to full scale production. It was used at that time to provide accurate regulation at a very small fraction of the design load and no longer is in use.

It will also be noticed in the drawing, *Fig. 11*, that the station is considerably longer than would appear necessary. The reason for the excess length is that the station was built between existing inlet and outlet piping of a previously abandoned meter station.

The chart shown in *Fig. 12* is from the 10-in. orifice meter gauge, the static pen of which is utilized for recording the regulated pressure just downstream of the two regulators. The chart indicates that excellent regulation is being

*The designation "full throat valve" is used categorically in this paper to denote valves of greater percentage opening than "venturi" or "short venturi" types.

Fig. 11. Meter and Regulator Station Y.


Material List
Item Quantity Description
A 1 4" Orifice Meter Tube with Robinson "Senior" Fitting
B 2 2" EMCO HP 1001 Regulator
C 2 4" MSS #115 Flanged Valve Incl. 150 Lb. Weldneck Companion Flanges (2)
D 3 3" MSS #115 Flanged Valve Incl. 150 Lb. Weldneck Companion Flanges (6)
E 4 2" MSS #115 Flanged Valve Incl. 150 Lb. Weldneck Companion Flanges (8)
F 1 6" x 4" Welding Reducer
G 2 6" 90° Welding Ell
H 2 2" 90° Welding Ell
I 2 2" 45° Welding Ell
J 2 6" 150 Lb. Lap Joint Flange
K 2 6" 150 Lb. Weldneck Flange
L 1 6" Welding Cap
M 1 4" Welding Cap
N 1 3" Welding Tee
6 1/4" x 2" Nipples (TOE) Plus Caps
Plan
Elevation

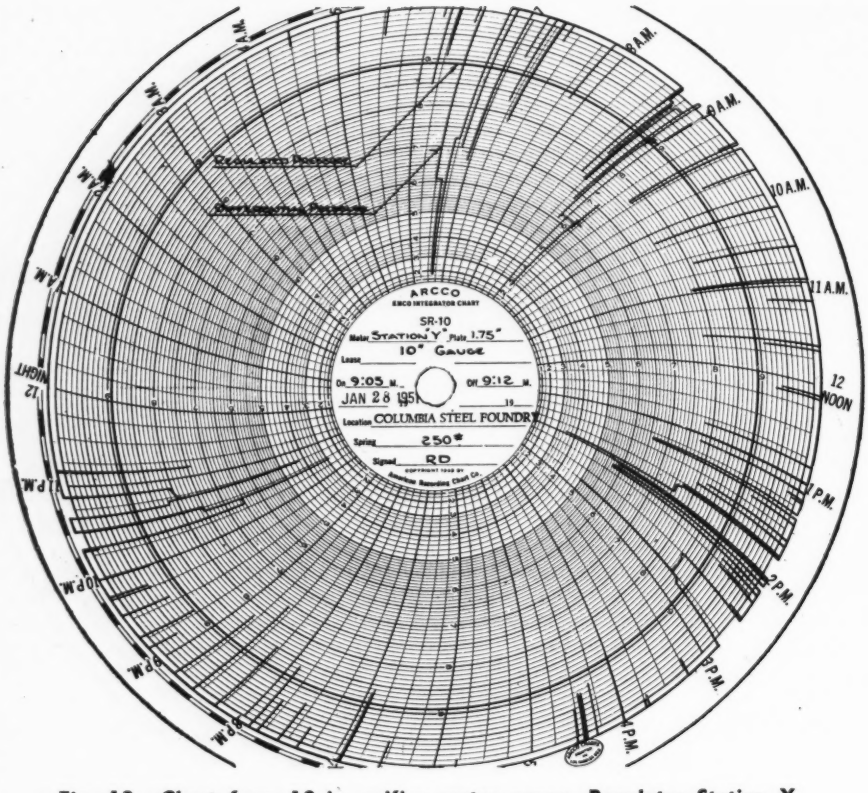


Fig. 12. Chart from 10-in. orifice meter gauge, Regulator Station Y.

TABLE 5. REGULATOR STATION "Y" - COMPARISON OF FIELD PRESSURE DROP MEASUREMENTS WITH CALCULATED VALUES

Regulator No. 1

	(1) From-To	(2) Section Description	(3) Load Q** (MCF/HR)	Field Test Values (4) Press. Diff. ΔP (PSI)	(5) Press. P (PSIG)	(6) Point	Calculated Values (7) Press. Diff. ΔP (PSI)	(8) Press. P (PSIG)
					126.00	A		126.00
Upstream	A - B	4" x 2" Sudden Contraction	28	0.14			0.024	
					125.86	B		125.98
	B - C	2" Full Throat Valve	28	0.03			0.009	
					125.83	C		125.97
	C - D	2" 90° Weld Ell	28	0.002			0.017	
					125.83	D		125.95
	A - D	TOTAL UPSTREAM	28	0.17			0.050	
Reg.	D - E		—	—	—		—	—
					26.80	E		26.80
Downstream	E - F	2" Full Throat Valve	26	0.29			0.036	
					26.51	F		26.76
	F - G	16" Straight 2" Pipe	27	0.05			0.027	
					26.46	G		26.74
	G - H	2" x 6" Sudden Enlargement	28	-0.08			0.168	
					26.54	H		26.57
	H - I	5" Straight 6" Pipe	27	0.03			0.000	
					26.51	I		26.57
	I - J	6" 90° Weld Ell	28	-0.01			0.000	
	E - J	TOTAL DOWNSTREAM	28	0.28			0.238	

* Letter Designations are from Pressure Profile for Regulator Station "Y"

** Load Q, was taken as 1/2 the total load recorded on the orifice meter, as the regulators were well balanced. As a check on this the following evaluation of load split between regulators was made:

Reg.	From-To	Section Description	Press. Diff. P (IN. H_2O)	Total Load Q MCF/HR
No. 1	A-C	2" - 4" Sudden Enlargement & 2" Full Throat Valve	4.8	57
No. 2	A-K	2" - 4" Sudden Enlargement & 2" Full Throat Valve	4.9	56

This indicates that we may assume an equal division of load between the two regulators without introducing appreciable error; i.e., we can assume load through regulator No. 1 was one-half of total load.

achieved despite the rapid changes in load indicated by the differential pen.

This station was chosen for a field test of pressure drops because the exact load at any time was available by merely reading the orifice meter chart. The graph in *Fig. 13* and calculations in *Table 4* show the comparison of actual pressure drops with calculated pressure drops, the actual values being extrapolated to full design load to obtain the most critical conditions. The apparatus used for measuring the pressure drops is shown in *Fig. 14*.

It is seen that there is considerable disagreement between the two sets of values. It would appear that the lack of agreement in the upstream section is largely, if not entirely, due to the fact that the data for a "sudden contraction" does not approximate the resistance of the actual configuration (which includes a 90° change in direction). The results in the downstream side are hard to evaluate as there is apparently a considerable "venturi effect" in the section. The pressure drops were checked several times and similar results were recorded each time. A comparison of field pressure drop measurements with calculated values, and a sample calculation of pressure drops, are shown in *Tables 5* and *6*, respectively.

This field test, though not an exacting fluid flow experiment, serves to demonstrate that data for similar configurations cannot be used to approximate the pressure drops through a fitting of unknown characteristics. Consequently, the application of the calculated "pressure profile" is limited to use on piping containing only the more common configurations. As a method of graphically presenting the results of field tests on "problem" stations in service, the "pressure profile" can be an aid in determining what corrective steps should be taken.

Incidentally, the field tests also indicate that if this regulator station is ever used at loads near the design maximum, it will be necessary to locate the control point beyond Point I shown on the pressure profile.

In conclusion I should like to note that the feeling exists in many companies today that too much engineering is being done on regulator station design. I am in agreement with this as regards the practice of designing each station "from the ground up," while ignoring the fact that the identical regulation problem has been handled over and over again. I disagree with this feeling, however, in that I believe more engineering should be done initially on each different regulation problem.

I believe that, as each company grows, it should develop "standard regulator station designs" for that 90% of the cases which constitutes the similar,

TABLE 4. REGULATOR STATION "Y" – FIELD PRESSURE DROP MEASUREMENTS EXTRAPOLATED TO FULL LOAD COMPARED TO CALCULATED FULL LOAD VALUES
Regulator No. 1

		FIELD TEST VALUES					CALCULATED VALUES			
(1)		(2)(a)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sec.	Vel. Heads F	Equiv. Lgth.2" Les (Feet)	Press. Diff. ΔP (PSI)	Press. P (PSIG)	Point	Vel. Heads F	Equiv. Lgth.2" Les (Feet)	Press. Diff. ΔP (PSI)	Press. P (PSIG)
Upstream	A-B	2.26	23.7	1.78	126.00	A				126.00
	B-C	0.48	5.0	0.39	124.22	B	0.40	3.9	0.30	125.80
	C-D	Negl.	Negl.	Negl.	123.83	C	0.15	1.5	0.11	125.69
	A-D		28.7	2.17	123.83	D	0.27	2.6	0.20	125.49
Reg.	D-E	—	—	—	—		—	—	—	—
Downstream	E-F	1.38	14.5	4.00	26.80	E	0.17	1.6	0.40	26.80
	F-G	0.24	2.5	0.70	22.80	F	0.13	1.3	0.40	26.40
	G-H	-0.38	-4.0	-1.20	22.10	G	0.80	7.8	2.90	26.00
	H-I	0.14	1.5	0.85	23.30	H	Negl.	Negl.	Negl.	23.90
	I-J	-0.05	-0.5	Negl.	22.45	I	Negl.	Negl.	Negl.	23.90
	E-J		14.0	4.35	22.45	J		11.0	3.70	23.90

* Q = 100 MCF/HR

$F = 0.00411$ and $L_e = \frac{FD}{48f} = \frac{F\ (2.067)}{48\ (0.00411)}$ (a)

$L_e = 10.5F$

TABLE 6. REGULATOR STATION "Y" – SAMPLE CALCULATION OF PRESSURE DROPS
Regulator No. 1

(1)		(2)	(3)	(4)	(5)	(6)
	Sect.	Description	Velocity Heads(a) F	Equiv.(a) Length 2" L_e* (Feet)	Pressure Diff.(a) per Vel. Head p* (PSI)	Press. Diff. ΔP (PSI)
Upstream	A-B	4" x 2" Sudden Contraction	0.40	3.9	0.062	0.024
	B-C	2" Full Throat Valve	0.15	1.5	0.062	0.009
	C-D	2" 90° Weld Ell	0.27	2.6	0.062	0.017
	A-D	TOTAL UPSTREAM		8.0		0.050
Reg.	D-E		—	—	—	—
Downstream	E-F	2" Full Throat Valve & 2" 45° Weld Ell	0.17	1.6	0.21	0.036
	F-G	16" Straight 2" Pipe	0.13	1.3	0.21	0.027
	G-H	2" x 6" Sudden Enlargement	0.80	7.8	0.21	0.168
	H-I	5" Straight 6" Pipe	Negl	Negl	0.21	0.000
	I-J	6" 90° Weld Ell	Negl	Negl	0.21	0.000
	E-J	TOTAL DOWNSTREAM		11.0		0.231

* Q = 28 MCF/HR

$f = 0.00445$ and $L_e = \frac{FD}{48f} = \frac{F\ (2.067}{48\ (0.00445)}$ (a)

$L_e = 9.7F$ (a)

recurring regulator station installations. The very use of "standard drawings," however, makes it all the more essential that the "standard" design be completely engineered initially, as any mistakes will be repeated scores of times, and mistakes are always paid for either with accidents or with money.

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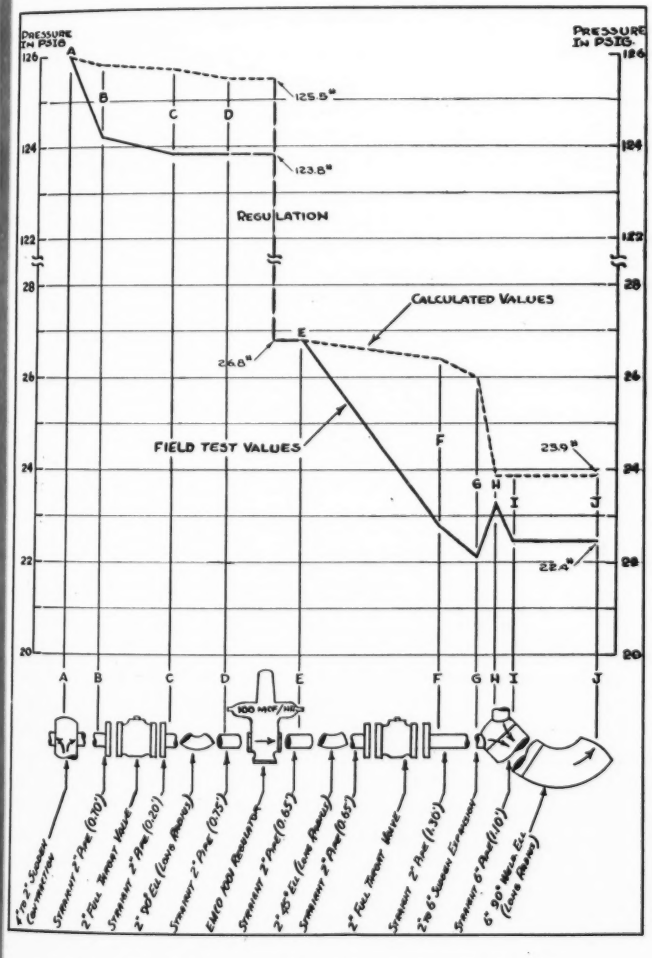


Fig. 13. Pressure profile, Regulation Station Y.

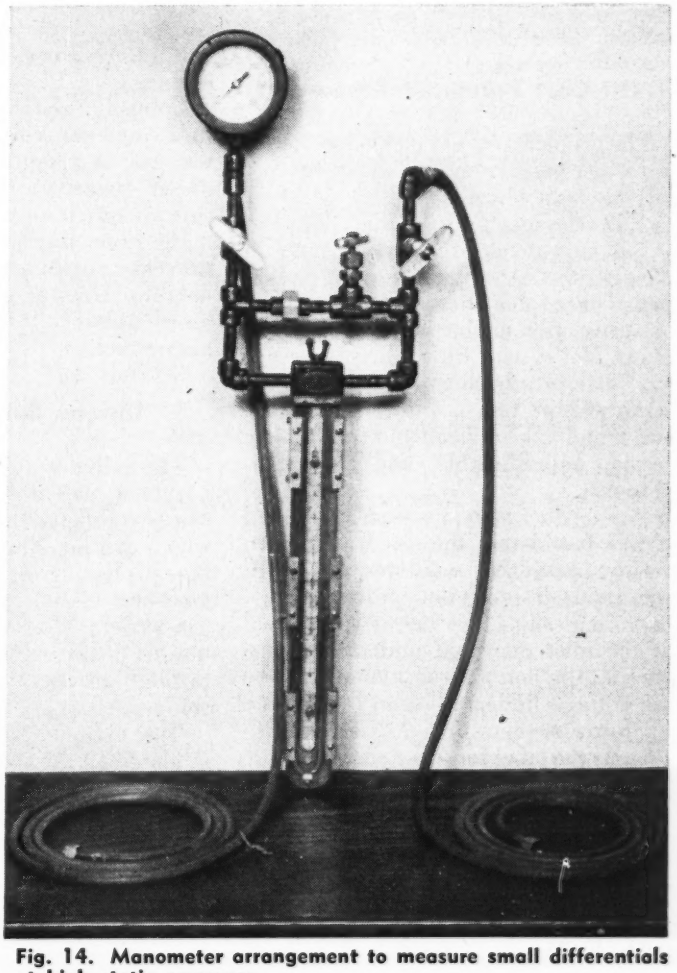


Fig. 14. Manometer arrangement to measure small differentials at high static pressures.

Fueling Diesel Engines With Natural Gas

Experience has shown that the gas diesel has better governing characteristics and more efficient performance, and if a gas shortage occurs it can be converted to run on 100% oil. Its operating features are described on the next page ➟

IN a number of fortunate areas of Canada, natural gas has been used already for many years as a fuel for heating homes, for industrial processes, and steam generating plants. The high thermal content and cleanliness of gas accompanied by low cost makes it a most popular and desirable fuel. If the gas pipeline companies go forward with their plans, natural gas will be distributed in many new places.

For many years low compression spark ignition engines have used gaseous fuel. The efficiency of these engines is low, and efforts to improve it by raising the compression ratio have not met with success. To operate gas engines on the diesel cycle has been the aim and goal of engine designers.

Oil Cost Prompted Research

The problem was not tackled seriously until just before the war when the cost of diesel oil began to climb. Most of the development work was done in U.S.A. and much of it started early in the 1930's. Designers in the United States based their first approach on the blast injection engine, and replaced the diesel fuel system with a high pressure gas valve to introduce gas in much the same way as fuel is injected. Starting was found to be difficult and combustion rough, unpredictable, and even dangerous.

A pilot fuel system was installed and it was found that the gas would burn evenly, provided a small quantity of oil was injected as a pilot igniter. Today, in most designs, the gas is introduced at the inlet manifold under low pressure and is compressed along with the air in the cylinder. Pilot oil is still used to insure regular firing. "Gas diesels" became the label for these engines.

The use of a fuel system to ignite gas may at first sight seem to be a costly substitute for spark ignition. Experience has shown that the gas diesel has better governing characteristics, more efficient performance, and if a gas shortage occurs it can be converted to run on 100% oil. The latter requirement has developed the "dualfuel" engine which is instantly convertible to either fuel.

American Locomotive Co. now has a considerable number of engines operating on pipelines and power station service in the United States. The system developed as a result of this experience combines simplicity and effectiveness with safety features not found in other designs.

Control of the system is concentrated in a single lever which will proportion the gas and liquid fuel from 100% diesel operation down to the lowest safe quantity of pilot fuel, and automatic protection is incorporated which prevents an inexperienced or careless operator from admitting gas to the engines unless all operating conditions are correct.

Unique Safety Features

The cylinder admission valves incorporate a patented metering chamber whose volume controls the amount of gas which can be admitted to the cylinder, thus protecting the engine against overload due to incorrect adjustment of the gas system. The valves also have the unique feature that gas cannot bleed through an open valve if the engine is stopped.

The cylinder admission valves are mounted on the rocker lever casing and are operated by extensions of the admission valve rockers. They are timed to open after the air inlet valve opens and after the exhaust valve closes. On supercharged engines the timing of the gas valve is arranged so that the gas is not blown with the scavenging air into the exhaust manifold.

Gas is supplied from the main through a surge tank and reducing valve to a gas header on the engine at 30 psi. Adjusting valves are provided on the gas header to balance the supply of gas to all cylinders. In order to govern the engine speed, a throttle valve is linked to the governor to increase or decrease the gas supply.

Economically Sound

It is not until the economies of dualfuel engines are examined that the reason for the enthusiasm for their development is realized. In a power plant operating a 1000-hp engine at an average of half load through the year, a dual fuel engine will save approximately $15,000 a year, assuming fuel oil to cost 15 cents a gallon and gas 15 cents per Mcf. Savings increase rapidly as the load factor is improved. The dualfuel unit reaches peak efficiency at full load when the savings would be about $35,000 per year.

The block chart illustrated shows the breakdown of costs in a typical diesel power plant in Canada. Fuel costs are the major item; by using natural gas the fuel bill can be cut to one-fifth. This means that operating costs are halved. Dominion-built Alco dualfuel engines are at present being installed on the Interprovincial pipeline in Edmonton. These units are particularly interesting in that crude oil directly from the line will be used for pilot ignition and gas from the nearby oil fields will be the main fuel. A double saving will be effected in this project.

Reprinted through courtesy of *Dominion Engineer*, house organ of Dominion Engineering Co. Ltd., Montreal.

Design and Operating Features of a Gas Diesel

General Details. The Dominion - Alco Model 538 is a simply designed 4-cycle diesel engine built in six and eight-cylinder sizes. It is available either naturally aspirated or supercharged at 600 rpm. The horsepower range is from 540 to 1080 bhp and this rating is for continuous 24-hour duty. Overloads of 10% may be carried comfortably for two hours. For intermittent standby service these ratings can be safely raised by operating at 720 rpm.

Fuel System. The fuel pumps and governor are grouped together at the side of the engine. Individual fuel pumps are provided for each cylinder. Any single unit can be easily and quickly replaced. Individual pumps are easy to balance and adjust to obtain optimum engine performance. Special types of fuel injection pump can be applied immediately without redesign of the pump block, as required by special applications such as the use of crude oil as fuel.

Governor. The Woodward hydraulic governor supplied for generator service is the type UG-8 with dial control and synchronizing motor. Engine speed can be controlled from the switchboard for synchronizing.

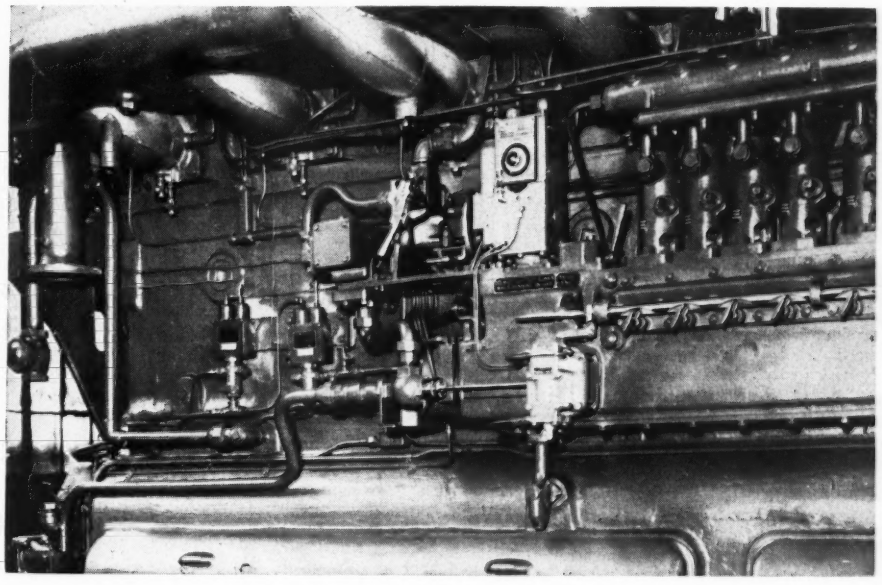
Turbocharger. The exhaust turbocharger supplied for supercharged engines is bracketed on the free end of the center section. It is manufactured under Büchi license to American Locomotive Co. design specially for this engine to provide mechanical ruggedness and reliability comparable with the performance of the basic engine.

Bearings. All crankshaft bearings have precision shells which can be removed for examination without disturbing the crankshaft. Access to these bearings is provided through large openings in the base, which are normally covered by light aluminum crankcase doors.

Valve Gear. All valve gear is totally enclosed and pressure lubricated. A geared camshaft operates two inlet and two exhaust valves in each cylinder head through push rods and rockers.

Performance. A totally enclosed design, a clean combustion, and a conservative rating give long periods between overhauls. This has been amply demonstrated in the performance of several thousand American-built Alco engines which have set many records in reliability over the past 12 years.

Adaptability. Engines can be supplied naturally aspirated with provisions for later supercharging in the field. In a small community where the population is expected to increase and industry to expand, the initial engines could be purchased as naturally aspirated units with the larger size generators fitted. As the load rises, superchargers can be added and the total plant capacity eventually doubled without the necessity of purchasing additional engines or extending the plant building. In areas where natural gas is available, or likely to become available, dualfuel engines can be supplied. Owing to the low cost of gas, the operating costs of dualfuel engines in some areas compare very favorably with other forms of electrical power.



Fueling system of the gas diesel is shown in this closeup of the engine.

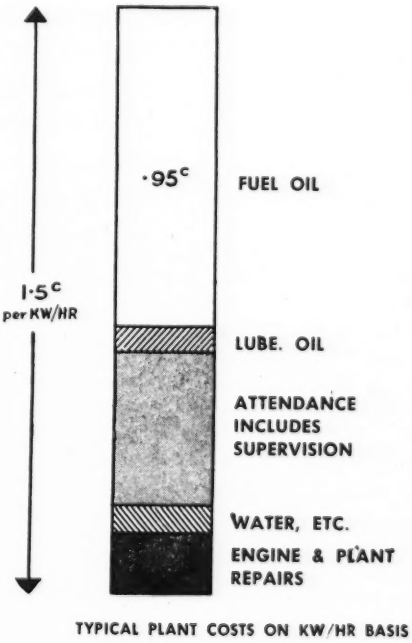


Chart shows breakdown of typical diesel plant costs. Fuel cost, the major item, can be cut to one-fifth by using natural gas.

Water Pump. An engine-driven water pump, gear driven from the main timing gears, is provided. A high rate of flow permits use of high jacket water temperature. This allows the use of a smaller radiator, evaporative water cooler or heat exchanger to be used. The high rate of flow gives only a few degrees difference between inlet and outlet temperatures. A better distribution of heat is therefore obtained throughout the engine.

Lubricating Oil Pump. A standard engine-driven gear type lubricating oil pump has an adequate surplus capacity to operate a by-pass oil filter or clarifier. The engine has built-in edge type lubricating oil strainers as standard equipment.

Oil Cooled Pistons. An annular cavity is constructed within the piston head through which lubricating oil is allowed to flow to extract heat from the piston crown. The lubricating oil is forced through the center of the connecting rod, around an annular groove in the wrist pin bushing, through the center of the wrist pin and is delivered to the piston head through drillings. The hot oil drains back to the crankcase through a cored passage on the inside of the piston head.

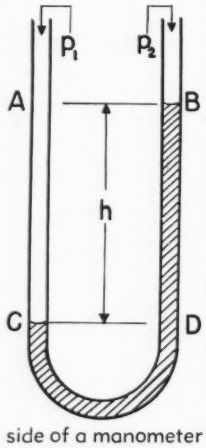
Lubricating Oil Sump. The bottom of the engine base is cast to form a lubricating oil sump tank. No separate tank in the engine room is required and external piping is therefore reduced.

Auxiliary Drives. All auxiliary drives are geared and taken from the flywheel end of the engine; thereby minimizing the transmission of torsional oscillations of the crankshaft.

CORRECTION FACTORS

for the balancing effect in one leg of a U-type manometer

By H. S. BEAN
U. S. Dept. of Commerce



The increase in the distribution and value of natural fuel gas, together with the higher line pressures at which such gases are metered with orifice meters, has induced measurement engineers to analyze carefully all factors affecting the accuracy of their gas measurements. One of these factors is the balancing effect of the column of gas in the high pressure side of a manometer (or low liquid). This article presents a mathematical analysis of the factor, showing that it is directly dependent upon the ratio of gas to the density of the manometer liquid. A table is given showing the magnitude of the factor for typical operating conditions. This is followed by a discussion of the application of the factor to the simple equal-area U-type manometer, and to the industrial type of recording differential pressure gauge, reading in inches of water, and having a manometer of unequal areas with a mercury and float actuating element.

REFERRING to *Fig. 1*, we will use the following notation:

h = the observed differential pressure, or "manometer reading"

ρL = density of the manometer liquid

ρG = density of the gas at pressure p_1 in the high pressure leg

p_1, p_2 = absolute pressures on the high and low pressure legs, respectively.

We will assume that the temperatures of the pressure lines and manometer are equal, and that $p_1 - p_2$ is small compared with either p_1 or p_2, so that at the plane A-B the weights of the fluid (gas) in the pressure connections above that plane may be considered equal.

Then at the plane C-D, we have

$$p_1 + h\rho G = p_2 + h\rho L \qquad (1)$$

or

$$p_1 - p_2 = h\rho L - h\rho G = h\rho L\ (1 - \rho G/\rho L) \qquad (2)$$

Thus, we see that the term $(1 - \rho G/\rho L)$ is a correction factor to the manometer "reading" to give the true pressure difference in terms of a column of the manometer liquid.

This correction may be, and usually is, neglected in ordinary work, especially at low pressures. However, when high precision is required or when the over-all pressure (i.e. both p_1 and p_2) is sufficiently high it becomes significant and should be taken into account, as will be illustrated later. Also, the correction should be taken into account when a liquid flow (e.g. water) is being metered and the differential pressure is measured with an inverted U-manometer to the top of which compressed air is admitted to bring the water surfaces in the manometer legs to a convenient reading position.

The conditions stated above as a basis for equation (1) will be fulfilled in most actual installations, especially if the difference in elevations of the differential pressure source and manometer is small, and if the temperatures of the pressure connections are sensibly equal. However, there may be installations where there is not only a considerable difference in the elevations, but also an appreciable difference in the densities of the gas in the two pressure connections due to large differences in the pressures and temperatures. To extend equation (2) to include the effects of such a condition, let

Z = difference in elevation between the differential pressure source and manometer. The sign Z will be positive (+) when the differential source is higher than the manometer, and negative (−) when lower than the manometer.

ρG = density of gas in the high pressure connection, corresponding to its pressure p_1 and average temperature, T_1.

ρg = corresponding density in low pressure connection at p_2, T_2.

Then at section C-D, *Fig. 1*

$$p_1 + h\rho G + Z\rho G = p_2 + h\rho L + Z\rho g \qquad (3)$$

and

$$p_1 - p_2 = h(\rho L - \rho G) - Z(\rho G - \rho g) = h\rho L(1 - \rho G/\rho L) - Z\rho G(1 - \rho g/\rho G) \qquad (4)$$

In equation (4), the factor $(1 - \rho g/\rho G)$ measures the effect of any difference in the densities of the gas in the pressure connections, and as Z increases the magnitude of the full correction term increases.

In developing the above equations, nothing has been said about the units in which the various quantities are expressed. Of course, in the factors $(1 - \rho G/\rho L)$ and $(1 - \rho g/\rho G)$ it is sufficient if the densities be expressed in the same units. However, in the use of equations (2) and (4), in which these appear, it will be necessary to take account of the units in which the several quantities are expressed. In engineering work, it is customary to measure pressures p_1 and p_2 in pounds per square inch, h in inches, Z in feet, and densities (or specific weights) are expressed in pounds per cubic foot. Applying these units to equations (2) and (4) gives:

$$p_1 - p_2 = \frac{h\rho L}{1728}(1 - \rho G/\rho L) \qquad (5)$$

and

$$p_1 - p_2 = \frac{h\rho L}{1728}(1 - \rho G/\rho L) - \frac{Z\rho G}{144}(1 - \rho g/\rho G) \qquad (6)$$

Table 1 has been prepared to show, for several conditions, the magnitude of the correction term as given by equation (5). In preparing this table, the following values were used:

Density of water at 60°F	62,367	lb per cu ft
Density of mercury at 60°F	846.322	lb per cu ft
Density of air at 60° and 1 atm.	0.07637	lb per cu ft
Specific gravity of methane	0.5449	air=1
Specific gravity of carbon dioxide	1.529	air=1

As indicated by the definitions above, ρG and ρg are the actual densities of the gas at the plane A-B, *Fig. 1*, in the high and low pressure connections to the manometer. Hence, in computing their values the effects of "supercompressibility" (i.e. departures from Boyle's law) are to be taken into account. The supercompressibility factor for the gas in question should preferably be obtained from an actual determination, but may be obtained from such tables as are given in Bulletin TS 461 of the California Natural Gasoline Assn. In this connection, it may be noted that at 60° F the vapor pressure of carbon dioxide is 747.5 psia,[1] and the value of the supercompressibility factor 60° F and 50 atm. was obtained by extrapolation from data given in *Table 1* of Communications of the van der Waal's—Fund, No. 93. On the other hand, it was assumed that the density of the manometer liquid is unaffected by pressure over the pressure ranges here considered.

The range of specific gravities of gases encompassed between methane and carbon dioxide includes most all gases of interest in the fuel gas industry, and with which manometers may be used under elevated pressures.

While the factors for a CO_2-water system are given for pressures up to the

[1]Table 8 of The Vapor Pressure of Liquid and Solid Carbon Dioxide, R.P. 538, NBS *J. of Research* Vol. 10, No. 3, March, 1933.

NEW IMPROVED MODEL "B"
Longhorn Mobile Ditcher

Cost of Digging Small Ditches Tumbles When Using This Ditcher

Versatile: Fits almost any digging condition; usable in tight spots, being only 26" center of ditch to outside; hydraulic "Hip Action" permits vertical digging on slopes or level ground; can turn a ditch in a 12-foot radius.

Mobile: As a light tractor; road speed of 20 miles per hour.

Economical: One-man operated; operating and repair costs surprisingly low.

Speedy: With a ditch marked off the machine swings into position, boom is lowered and digging is from 1 to 25 feet per minute, depending on soil and depth of ditch.

Compact: Without moving from his seat operator drives machine, adjusts "Hip Action," raises or lowers boom and reverses soil conveyor.

Safe and Rugged: Practically all gears are covered with removable housings; drives are on sealed ball bearings; chassis is borne on Timken tapered roller bearings; gears run in oil.

Quick Repair: The Longhorn Mobile Ditcher is built as a unit design, and unit replacement parts are always available for immediate delivery; removal and attachment of unit replacement is a simple operation.

To have complete information about the Longhorn Mobile Ditcher is to realize that this machine is unequalled for digging small ditches.

Your request for information will receive our prompt attention.

LONGHORN INDUSTRIES, INC.
P. O. BOX 350 • HENDERSON, TEXAS

vapor pressure of CO_2, such a system would be of limited use because the solubility of CO_2 in water increases rapidly as the pressure is increased. The reason for including the CO_2-water factors is to illustrate the magnitude of the correction factor for gases having a specific gravity in the range of CO_2.

It was convenient, for showing the quantities used in developing the equations, to illustrate in *Fig. 1* the conventional design of manometers, in which the two legs are of approximately equal areas. However, the analysis and equations apply to any design of manometer employing a liquid column to measure the difference between two pressures.

In the great majority of commercial gas metering installations involving the measurement of a differential pressure, some form of recording gauge is used. Most of these recording differential-pressure gauges have a mercury manometer of unequal leg areas. In the larger leg, or pot, there is a float, which, through a system of linkages, operates a recording pen over a chart graduated in inches of water. Now the question arises as to what correction factor should be applied to the readings of such a gauge.

First, consider only the manometer element of this gauge. Obviously, this falls in the gas-mercury group, with correction factors ranging down to about 0.99. If these correction factors are applied to the "observed" mercury column readings, we obtain the value of the differential pressure in "corrected" inches of mercury.

Next, it is to be noted that the linkage system between the float and pen magnifies the differential in inches of mercury by a factor M(=13.57) so that the pen indicates the value of the differential pressure in inches of water. Hence, if we have first obtained the differential pressure in "corrected" inches of mercury, multiplying this value by M will give the corresponding value in "corrected" inches of water. Now, the product obtained by multiplying a given quantity by two factors is independent of the order in which the factors are used. Therefore, the same result will be obtained if the "uncorrected" inches of mercury are multiplied first (mechanically) by the magnification factor M, to give "uncorrected" inches of water, and then this quantity is multiplied (manually) by the appropriate gas-mercury manometer factor to give "corrected" inches of water. Hence, with a mercury and float type of recording differential pressure gauge, we will use the gas-mercury manometer factors regardless of the units employed for the indicating element of the gauge.

As an (extreme) illustration of the possible effects of difference in elevation of pipeline and recorder, and the temperatures of the pressure connections assume that a gas having a specific gravity G, referred to air, of 1.46 is being metered with an orifice meter under the following conditions:

p_1=125 psia
h=90 in. water at 60° F
T_1=70°F average temperature of high pressure connection
T_2=90°F average temperature of low pressure connection
Z=50 ft

First, let it be assumed that h is the observed reading of a simple U-type water manometer so that ρL=62.367 lb/ft³. For the conditions given above[2]

$$\rho G=(2.7025\times\frac{125}{530})\times 1.46=0.9306 \text{lb/ft}^3$$

This value may be used in equation (5) to give the manometer correction factor only; thus

$$p_1-p_2=\frac{90\times 62.367}{1728}\left(1-\frac{0.9306}{62.367}\right)$$
$$=3.248\text{x}0.985=3.200 \text{ psi} \qquad (7)$$

Before we can proceed with the computation of the effect of the 50-ft difference in elevation combined with the difference in the gas densities within the connection lines, as given by the right-hand term of equation (6), it will be necessary to compute ρg. In order to do this, the value of p_2 is required, and we have the choice of two procedures. The first is to use the result obtained above by the use of equation (5) to give a first approximate value of p_2. With this value of p_2, values of ρg and the elevation density term are computed, and a second and closer approximate value of p_2 is obtained. Then, if it seems worthwhile, the process may be repeated to obtain more exact values of the correction term.

The second, which is the mathematically proper procedure, is to use the relation

$$\rho g=\frac{2.7025\, p_2 G}{460+T_2} \qquad (8)$$

in equation (6) to give the following expression for the value of p_2

$$p_2=\left\{p_1-\frac{h\rho L}{1728}(1-\rho G/\rho L)+\frac{Z\rho G}{144}\right\}\left\{\frac{144(460+T_2)}{144(460+T_2)+2.7025GZ}\right\} \qquad (9)$$

In using equations (8) and (9), it is still necessary to compute the elevation-density correction term if this is of interest. For the sake of illustration, the results by both procedures are given.

By the first procedure, the approximate value of p_2 is 121.80 psia and that of ρg is 0.8738 lb/ft³.

The elevation-density term of equation (6) is

$$\frac{50\text{x}0.9306}{144}\left(1-\frac{.8738}{.9306}\right)$$
$$=0.0197 \text{ (or 0.02 very nearly)}$$

and thus the second (approximate) value of p_2 is 121.82 psia. Obviously, the effect of the small change in the value of p_2 will have no appreciable effect upon the elevation-density correction term.

By the second procedure, we have by equation (9)

$$p_2=\left\{125.00-3.200+.323\right\}\left\{\frac{79200}{79200+197.3}\right\}$$
$$=121.82 \text{ psia}$$

Since, by the use of equation (5) alone the approximate value of p_2 was 121.80, it is evident that the elevation-density correction term amounts to 0.02 psi as found by the first procedure.

Now let us suppose that in the above example the differential pressure had been measured with a mercury recording gauge "geared" to indicate inches of water. The actual mercury column providing the balancing pressure between p_1 and p_2 is, approximately

$$90\times\frac{62.367}{846.322}=6.632 \text{ in.}$$

by equation (5)

$$p_1-p_2=\frac{6.632\times 846.322}{1728}\left(1-\frac{0.9306}{846.3}\right)$$
$$=3.248\times 0.9989=3.245 \text{ psi.}$$

Following the first procedure discussed above, the value of the elevation-density correction term is 0.0199 (i.e. 0.02 as before). Thus, the adjusted differential pressure is 3.225 psi, as compared with 3.18 psi when an ordinary water manometer was used.

[2]For an equation by which to compute the density of a gas, see ASME Fluid Meters Report, 4th Ed., par. 84, and equation [100(b)].

TABLE 1. Values of the Manometer Factor $(1-\rho G/\rho L)$

p_1 atmospheres	1	10	25	50	100
p_1 psia	14.70	147.0	367.5	735	1470
Air-water	.999	.988	.969	.938	.876
Air-mercury	1.0	.999	.998	.995	.991
Methane-water	.999	.993	.982	.962	.918
Methane-mercury	1.0	.9995	.999	.997	.994
Carbon dioxide-water	.998	.980	.945	.84	
Carbon dioxide-mercury	1.0	.9985	.996	.99	

Monitoring Fuel Gas Levels With

A NEW ODORIMETER

By C. ELDON WHITE
San Diego Gas & Electric Co.

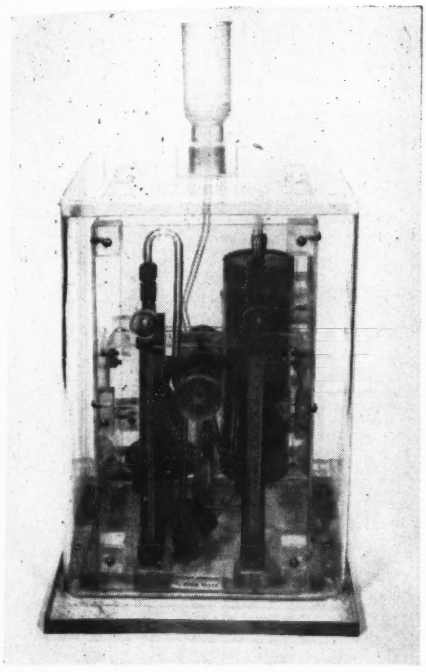


Fig. 1. Front view of odorimeter.

THE purpose of the new odorimeter* which we have developed is to determine whether a fuel gas when diluted to a standard degree still has enough odor to warn of its presence before reaching a dangerous concentration, or alternatively to evaluate numerically the odor level of a gas by means of psychometric measurements according to Weber's law.

This instrument completely extracts a known proportion of odorant from the gas, in effect diluting the odorant material to any known fraction of the original content; the odor of the resultant gas may be judged as present or absent, etc. The effect on the odor is the same as if the odorized fuel gas had been diluted with the same proportion of air.

A novel feature is that the odorimeter is operated solely by a single stream of gas flowing from a main or vessel; this gas alone furnishes the power, whereas other odorimeters[1,2] require not only a source of the gas whose odor intensity is to be measured, but also auxiliary equipment in order to furnish a simultaneous flow of air or other odorless medium for dilution of the fuel gas; such equipment has included, for example, an air compressor or blower with electrically driven motor, or a large air-filled closed room, the bulk of which is not favorable to portability or ease of operation.

The odorimeter provides for the admixture of any chosen proportions of odorized fuel gas and deodorized fuel gas drawn from a single source, and the presentation of the mixture to a funnel or nosepiece; the mixture may be smelled, and the degree of odor estimated either numerically or as being perceptible or imperceptible. For example, the proportion of odorized gas in the mixture may be set at any standard value, whereupon its perception by the sense of smell indicates that the original odorized gas contains sufficient odorant to be smelled, when present in the standard proportion, and therefore meets the predetermined standard for odorization. (It is well known that any odor may be diluted to such a low concentration, called the *threshold*, that, although present, it can no longer be smelled.) The absence of moving parts, the simple design, the use of the kinetic energy of fuel gas as the sole source of energy, and as diluent (in lieu of air) of deodorized gas derived from the same source, permit the instrument to be readily portable and easy to use.

Fig. 1 is a view of a model of this instrument built, for display, chiefly of transparent Lucite. Less brittle material is better for field conditions, although this model was sturdy enough to have survived transportation to and demonstration within a number of distant states.

Fig. 2 is a flow diagram of the odorimeter.

Two prototypal models of this odorimeter have been used daily for some time as monitors of the odor level of our gas at the 1% level, a value which is extremely lenient. Good correlation was obtained with a closed room test at 1%.

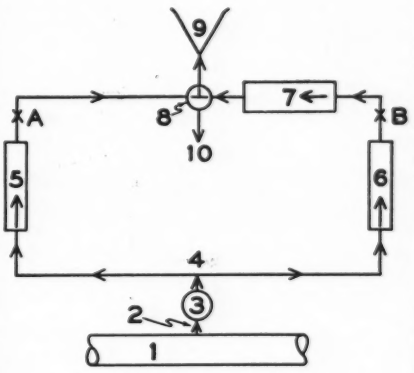


Fig. 2. Flow diagram of the odorimeter. Odorized gas from the main **1** enters inlet **2** of the odorimeter, passes through the pressure regulator **3,** and divides at the tee **4.** The smaller proportion ordinarily goes to the left through the low-capacity flowmeter **5;** the larger proportion goes to the right through the higher-capacity flowmeter **6.** Needle valves **A** and **B** are adjusted so that any desired ratio of flow may be obtained in flowmeters **5** and **6** respectively. So far both streams have the same concentration of odorizing material; but now the gas on the right side passes through a cannister of activated carbon **7,** where every trace of odorant is removed; the deodorized gas passes to the selecting valve **8,** meeting the odorized gas from the left branch. By a turn of the selecting valve **8** to the proper position, the mixed gases pass either to the purging vent **10,** or to the smelling funnel **9** (filled with glass rings to diffuse the gas stream).

The nose, in the latter case, is inserted well into the funnel **9,** and a long, slow inhalation brings the gas to the sensory organs; the degree of odor is estimated rapidly. It is easy to assess the quality of the diluted odor. By reading flowmeters **5** and **6,** the degree of dilution of the odorized gas in the odorless gas, or strictly speaking, the proportion of odorizing substance still remaining in the gas, is calculated; the degree of odor is the same as if this proportion of fuel gas were mixed with air. Both flowmeters are at the same temperature and pressure, and pass the same gas (except for the negligible trace of odorant); hence their previous calibration with air serves to give the correct proportions of gas also. The pressures at the two flowmeters may be equalized precisely by the addition of choke valves and a differential manometer; this is hardly required for field tests. A total flow of 1/3 cu ft per min has been found satisfactory.

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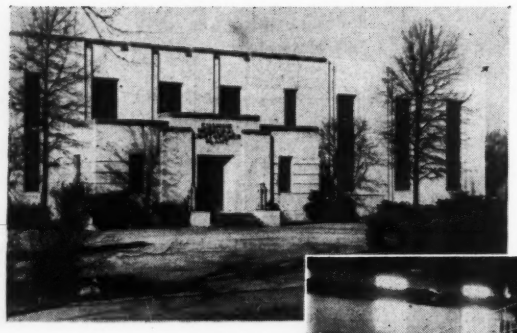
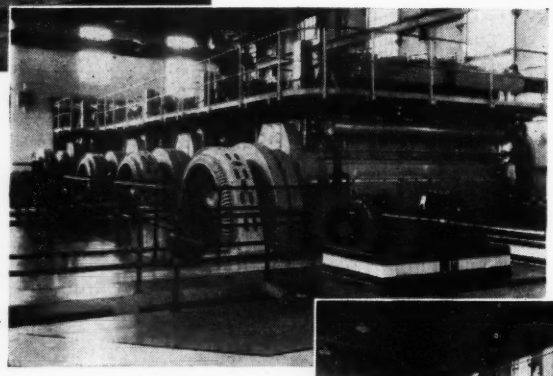
2. Wilby, F. V. Portable Odorometer and Method for Measuring the Odor Level of Odorized Gas, PCGA technical section, technical services conference, Los Angeles, March 7-8, 1951.

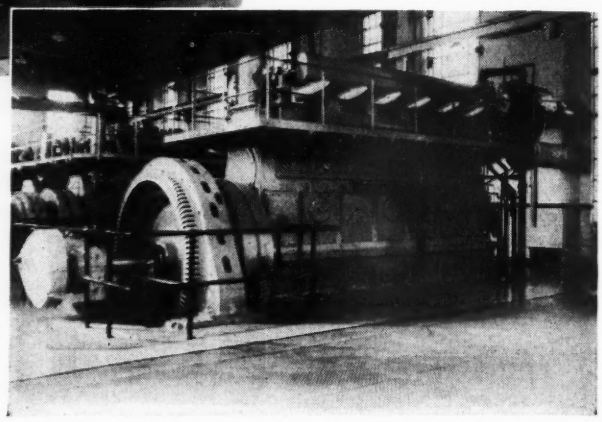
*Patent pending.

This article is a portion of a paper presented at the PCGA technical section distribution conference, April 4-5 at Riverside, Calif.

Generating Power With Natural Gas







TOP: Smoke-free natural gas burned in the internal combustion engines at the Cushing, Okla. municipal light and power plant helps to preserve the clean, park-like atmosphere of landscaped grounds.

CENTER: The four converted diesel engines now use 7½% fuel oil and 92½% natural gas.

BOTTOM: This 1420-hp engine was designed to use 19% fuel oil and 81% natural gas. It has a capacity of 100 kw at 277 rpm.

By ARTHUR Q. SMITH
American Gas Assn.

AN economical use to which natural gas is put in areas where it is plentiful and cost of transportation and distribution is low, is for the production of electric energy. Some large steam generating stations use it under boilers while others use it directly as a fuel in direct connected internal combustion engines and converted diesels.

A typical example of this economical use of natural gas is in the small generating station of the Cushing, Okla. municipal light and power plant. This community of approximately 8000 population has a new and modern electric plant with five diesel engine-generator sets. Originally installed to use diesel oil exclusively, the four engines were recently converted to burn both natural gas and diesel oil.

Cushing Installation

One of the installed engines and generators is an 1170-hp, 8-cylinder, (17½x25-in.), 4-cycle, 800-kw at 257 rpm engine. Three are 750-hp, 6-cylinder, (17½x25-in.), 4-cycle, 500-kw at 225 rpm engines, and the fifth is a 1420-hp, 6-cylinder with supercharger, 1000-kw at 277 rpm engine. This last-mentioned engine was purchased ready to run on oil and natural gas, using 19% fuel oil and 81% natural gas. When the plant was designed, space was left for the installation of a sixth unit of similar size.

The conversion of the four diesel engines was suggested by gas engineers as an economy measure. It had been calculated on a basis of horsepower and kwh production that a combination of gas and oil would reduce power production costs. The four original diesel engines were converted to gas-oil engines using 7½% fuel oil and 92½% natural gas.

At the time I visited the plant, the latest figures available on operating costs were for the month of January 1950 when power production was 872,500 kwh. For this period 7712 Mcf of natural gas were used at $.1811 per Mcf for a total of $1396.65, 17,904 gals. of fuel oil were used at $.06⅛ per gallon for a total of $1096.63. This made a total of $2493.28 for both fuels.

The last month during which only fuel oil was burned, before conversion, and for which the kwh figure was substantially the same, the fuel oil cost was $4110.79. Deducting the cost of combination fuel of $2493.28, the saving is shown to be $1617.51. This is entirely due to the use of natural gas in combination with fuel oil.

Cost Analysis

A further analysis was furnished on the overall cost of producing electric energy. All costs of plant operation are included and represent the figures on the town books. Of course, since this is a municipal operation, no tax costs are included. When the plant was operating on fuel oil only the cost of power production was 8 mills per kwh. Since natural gas has been used in greater proportion with fuel oil the cost of power production has dropped to 3 mills per kwh, a remarkable saving even for a small plant such as this one.

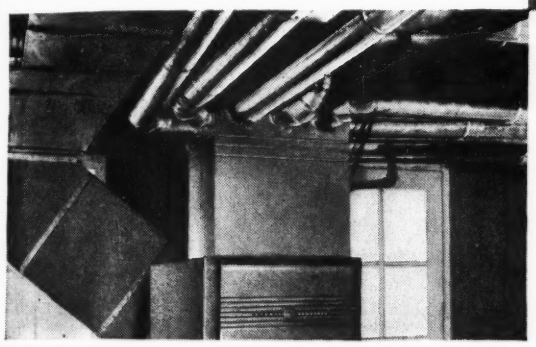
The original suggestion for the conversion of the engines to dual fuel was a result of the enterprise of the gas engineers of Oklahoma Natural Gas Co., in whose territory the plant at Cushing is located.

GAS HOME HEATING

THE G-E AIR-WALL HEATING SYSTEM

—for use with G-E Gas Furnace

BABY SPENDS A LOT OF TIME on the floor. That's one reason why G-E "Climate Engineers" developed *Air-Wall* Heating. This system uses a specially designed register that operates much in the manner of the windshield defroster slot in your car. Warm air is directed upward along cold walls, warms them so that *heat* rather than cold is radiated. Rooms have even temperatures at all levels, even on the floor.



AIR-WALL IS EASY TO INSTALL. In this typical installation, note how the small ducts, 4" in diameter, allow more headroom. Movement from 0° to 90° is possible with adjustable elbows. This ductwork can also be easily imbedded in the concrete slab floor of modern, basementless houses.

LATEST PRODUCT which helps sell General Electric Gas Warm Air Furnaces is the G-E *Automatic Air-Wall* Register, pictured at the right under the window. This register contains its own thermostat which opens and closes a built-in damper, thus admitting or shutting off warm air from the furnace as desired.

Two types of heat—forced warm air and radiant—are provided in one economical system consisting of a G-E Gas Warm Air Furnace, small diameter round ducts that are low in cost and easy to install, and G-E *Air-Wall* Registers.

This amazing new system of distributing heat has gained immediate popularity. Full comfort, freedom of furniture placement, better looking basement or utility room, and quiet operation are now possible. The *Air-Wall* System, with its small ductwork is well suited to defense housing.

New developments, such as *Air-Wall* and the G-E Year 'Round Air Conditioning System for automatic summer and winter comfort, open new market horizons for G-E dealers. National advertising and a strong array of powerful sales tools are creating demand for G-E Gas Heating Equipment. G-E sales outlets are cooperating with utilities to promote the wider use of gas heating. General Electric Company, Air Conditioning Department, Bloomfield, New Jersey.

You can put your confidence in—

GENERAL ELECTRIC

IMPROVING SCRUBBER PERFORMANCE WITH A Differential Recording Gauge

By HARRY M. KEMMERER

Southern Counties Gas Co. of California
Los Angeles

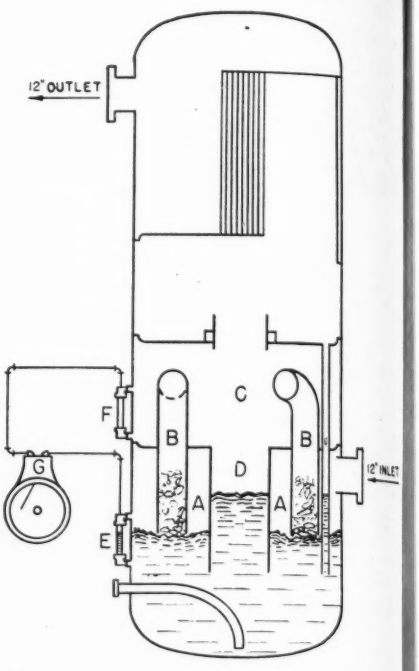


Fig. 1. Schematic cross section of 60-in. diameter scrubber.

HIGH oil-carryover and insufficient dust removal of a scrubber used by Southern Counties Gas Co. of California to protect the main distribution area in Orange county have been rectified through the use of a 50-in. differential recording gauge.

A study of the chart from the gauge has enabled us to improve the operation of the scrubber, reduce oil loss and inspection expense.

The gauge was connected as shown in *Fig. 1*, which graphically depicts the operation of the scrubber. Gas entering the scrubber forces the level downward in chamber A, causing the level to rise in tubes B and D, until the level in A reaches a point where it allows gas to enter and escape upward through mixing tubes, B, where a forcible mixing of oil and gas occurs. Some of the oil in B is carried up with the flow of gas and is sprayed into chamber C, where most of the oil spray is then deposited and allowed to flow down through tube D. The balance of the spray is removed by the separators in the top chamber; this oil is collected and returned to A by means of pipes not shown in the diagram.

In order for the forcible mixing to take place, as described above, the level in A must be at least high enough to restrict the flow of gas into tubes B. Any lower level will allow fine dust in suspension to pass through the scrubber and cause trouble downstream in meters, regulators and appliances. On the other hand, too high a level will flood the upper chamber C, causing excessive amounts of oil to be carried to the separators above. When these separators become overloaded, oil is carried through the scrubber, eventually to be found in customers' meters, or in distribution lines where it causes regulator seats to swell up and fail.

Experience with this scrubber has shown that when oil appears in the upper gauge glass F, the level is much too high, carryover is excessive and trouble may be expected downstream. Even when the level is set low enough, if the scrubber gains oil or water from upstream neither gauge glass will show this gain until the level is too high.

The lower glass E is useful in draining and refilling, but in operation this level shown in this glass remains nearly constant, irrespective of the oil level in tube D or in chamber C. This lower gauge glass shows only whether the oil level is high enough to produce a thorough mixing action. With the gauge glasses indicating only whether the level was too high or too low, the actual oil level was usually unknown, frequent inspections were necessary to avoid serious trouble, and good operation was not obtained.

The gas pressure on the two surfaces of the liquid in A and in D will differ by the amount of the static head of the liquid in D, so that a differential gauge calibrated to read in inches of oil will indicate the height of oil in tube D above the level in chamber A. Such a gauge was installed on this scrubber in August, 1950, and a daily chart was taken for about the first month. By inspecting orifice plates in meters downstream and referring to the charts from the scrubber gauge, it was determined that the optimum level for efficient operation of this scrubber was between 4 and 12 in. of oil in column D above the level in A. Once this was determined, the chart has since been changed only three times a week. If the installation were not on a daily chart run, a weekly chart would save mileage and serve the purpose nearly as well, now.

The flow through this scrubber varies widely during a 24-hr period. Minimum gas flow since this gauge was installed was slightly less than 300 Mcf/hour, and maximum flow to date is 1200 Mcf/hour, with operating pressure ranging from 90 psig in summer to 160 psig in winter.

A comparison of the charts from the scrubber gauge with those from an orifice meter measuring the same gas shows that when the oil level is carried within the proper range it is practically independent of gas flow. There is a gradual day-to-day drop in level as the oil is used up, showing the approximate rate of usage of oil. The chart, therefore, indicates when inspection and refilling is necessary. As a result, the frequency of inspections has been reduced from twice a week to once every two or three weeks.

The improved efficiency of the scrubber is shown by the fact that there have been no difficulties with either oil or dust in the past six months. It seems conclusive that the cost of operating this gauge is less than the saving made possible by its operation.

NEWS

Regulation

El Paso Continues Line; Common Carrier Fight Won

Balked with finality in his efforts to force El Paso Natural Gas Co. to agree to expand its facilities—if necessary—to carry other companies' gas, Secretary of the Interior Oscar Chapman on July 9 issued a right-of-way permit allowing the company to build the last 16 miles of its giant New Mexico-to-California pipeline.

The 16 miles in question lay across public lands, and the secretary's idea was to bulldoze the company into becoming a common carrier, in fact, by withholding the permit until El Paso agreed to the stipulations.

Progress on the line had halted some weeks ago when the company reached the border of public lands. President Paul Kayser resorted to court action to force Secretary Chapman to issue the permit. On June 28, in Washington, Federal Judge Walter Bastian ruled in favor of the company, and ordered the permit to be given within 10 days.

Mr. Chapman then appealed, but on July 6 the court of appeals refused to set aside the lower court's decision.

El Paso expected to have the job finished this month, with service to start immediately in Northern Arizona as well as the San Francisco bay area.

Regulations Revised

Supplement 1 to M-46, recently issued by the National Production Authority, explains how allotment numbers are to be used to secure delivery of controlled materials in each calendar quarter and to obtain materials which are not controlled but for which priorities assistance may be authorized. Allotment numbers now available to an operator, as defined by M-46, are H-1—to secure material only for use in a construction operation, H-2—to secure material only for use in a production operation, and H-9—to obtain maintenance, repair and operation material only.

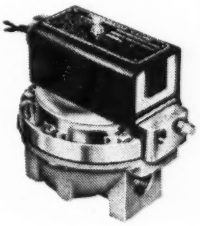
NPA order M-12 has been amended to remove various regulations on use of copper and copperbase alloys which have recently been incorporated in other orders. Prohibitions in use of copper products in manufacture of consumer durable goods are now covered in M-47A; maintenance, repair, and operating provisions of M-12 will be supplanted by CMP Regulation 5; and inventory restrictions will be handled in CMP Regulation 2. A new order to be administered by the Building Materials Division will include restrictions on use of copper products in building materials. On Aug. 1 provisions of M-12 were superseded by revised order M-16, which controls the distribution of copper raw materials.

Under Supplement 1 to Delegation 13, NPA has delegated to PAD authority to reschedule deliveries of controlled materials for the petroleum and gas industries. However, PAD has been granted no authority to reschedule production.

WANT TO BE "WALKING ON AIR," TOO?

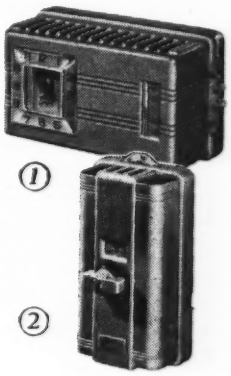
Then you'll want to know these important facts about Honeywell's finest controls.

Here is one of the best diaphragm gas valves ever made!



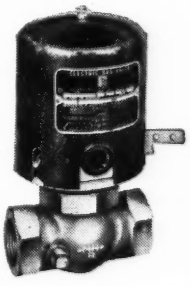
The new V899, illustrated, is a real engineering triumph! It fits far smaller spaces than previous valves, yet often exceeds them in capacity. And thorough field tests have proved that it's as safe and dependable as the older models. Available in sizes from ¾" to 2". Manual opener with automatic recycling optional.

These Honeywell Thermostats have special features not found in ordinary controls!



1) *Honeywell's new Chronotherms* are the most sensitive, most accurate thermostats ever built! They automatically lower the temperature at night to save fuel; automatically raise it in the morning so your customers get up in a nice, warm house. 2) *"Day-Nite" control* distinguishes the Time-O-Stat from ordinary thermostats. It provides lowered night temperatures with automatic morning pick-up.

This is the finest motorized gas valve on the market!



The V-155, illustrated, has proved highly successful for use on furnaces, conversion burners, boilers. For use in the field of low-voltage motorized gas valves, this rugged valve is built to give long years of dependable service.

For full facts on any of the above equipment, write today to Dept. GS-8-122, Minneapolis 8, Minnesota.

MINNEAPOLIS **Honeywell**

First in Controls

City Gets Impounded Fund

A U.S. District Court of Appeals has ruled that some $90,000 impounded in an old gas rate case shall be transferred to the general fund of Kansas City, Mo.

An $8 million dollar refund to Kansas City consumers grew out of a case instituted by the Missouri Public Service Commission in 1939. Cities Service Gas Co. later was ordered to reduce its rates to distributors in four states.

When refund checks were mailed out to Kansas Citians, some of the owners could not be located so the court was asked to order the impounded money paid to the city.

Financial

TGT Rate Increase Denied And Suspended by FPC

A 20% rate increase which would have upped Tennessee Gas Transmission Co.'s (Houston) revenues for the year ending July 31, 1952 from $83.3 million (estimated under present rates) to $99.6 million was suspended and rejected by the FPC in mid-July.

Rates suspended pending hearing and decision cover sales of natural in Louisiana, Mississippi, Tennessee, Kentucky, and West Virginia and would have increased cost to customers in those states by $13.6 million. Their use was deferred until Dec. 16 and until such further time as they may be made effective under the Natural Gas Act. The rejected rates cover, principally, service in Ohio, Pennsylvania, and New York, and costs to Tennessee's customers in these areas would have been increased by $2.7 million.

The proposed rate change, which was to have become effective July 16, would have affected all TGT customers, but especially United Fuel Gas Co., Charleston, W. Va.; and Hope Natural Gas Co., Clarksburg, W. Va. These two firms would have borne about ¾ of the total increase.

At the same time, FPC accepted for filing new emergency service rates proposed by TGT and prepared to investigate whether they are just, reasonable, and nondiscriminatory.

Gas Revenues, Income Up

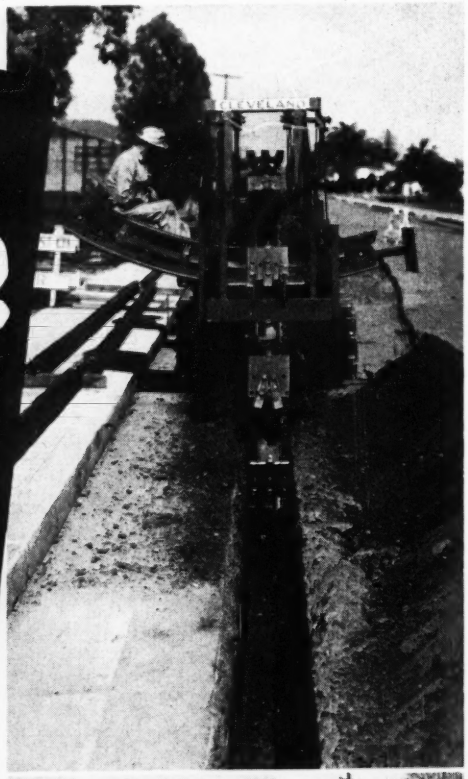
Operating revenues of natural gas companies for April, as reported by the Federal Power Commission, totaled $139,065,864, an increase of 16.4% over April 1950.

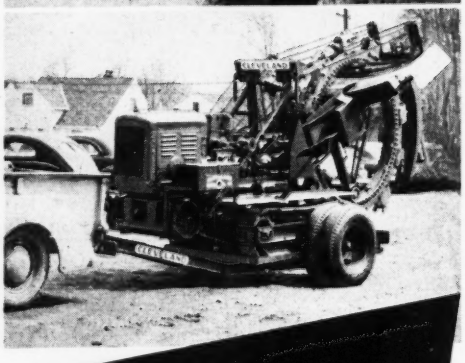
Gas utility operating income for the month amounted to about $24.8 million; net income was $20.38 million. April sales reached more than 202 billion cu ft, an increase of 13.2% over the same month last year. Operating revenues for the 12 months ended April 30, 1951 showed a 25.7% increase over the previous 12 months, and net income for the period was up 20%.

Revenue deductions for April showed a 20.2% increase, rising to $114,323,874. Accounting for this rise, operating expenses were up 14.5%, depreciation up 17.6%, and taxes rose to 50% more than during April 1950.

more usable

ON ALL YOUR DISTRIBUTION TRENCHING





THE CLEVELAND "BABY DIGGER" model 92

Tailored to gas industry needs, the versatile "92" blankets the whole field of main extension and house service work—10" to 20" wide and up to 5 full feet deep. Loads on or off its tilt-bed "T-5" trailer in 5 minutes for quick jumps between jobs. Small and compact with instant-shift conveyor for narrow city clearances—puts the edge of a 20" trench within 17" of a side wall. Hairline control with positive brake-and-differential steering. Smooth-pad 10" crawlers protect walks and curbs—no tires to spin and gouge lawns. 18 digging speeds—up to 27' per min. Extra ruggedness, extra power for dependable year-'round bonus yardage in any soil without costly maintenance down-time. Get the full story today on CLEVELANDS greater "usability". See your local distributor or write The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Visitors at the National Assn. of Master Plumbers convention in Chicago examine a gas boiler displayed in the exhibit of American Radiator & Standard Sanitary Corp., Pittsburgh.

A "tunnel of mystery," illuminated by "black light," featured moving fluorescent displays, and a recording promoted the plumbing and heating modernization program. Beyond the tunnel, latest American-Standard plumbing fixtures and heating equipment models were arranged among hundreds of flowers and parasols in a garden.

Humphrey GAS HEATING EQUIPMENT

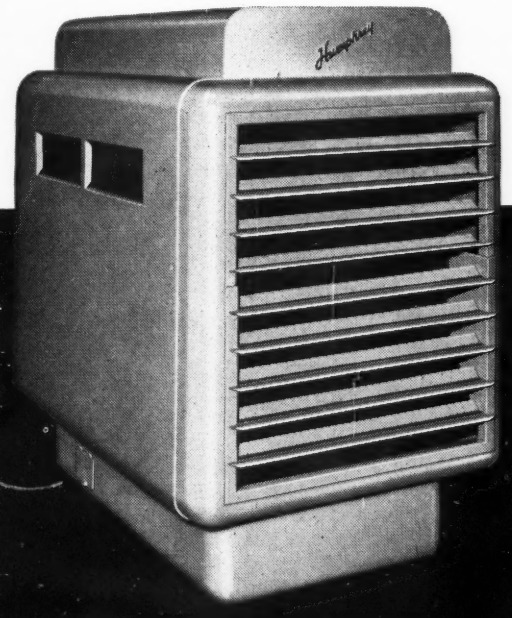
★ EASY TO SELL!
★ EASY TO INSTALL!
★ ECONOMICAL TO OPERATE!
★ LASTINGLY DEPENDABLE!

Humphrey Gas Heating Equipment is one of the most satisfactory lines a dealer can handle.

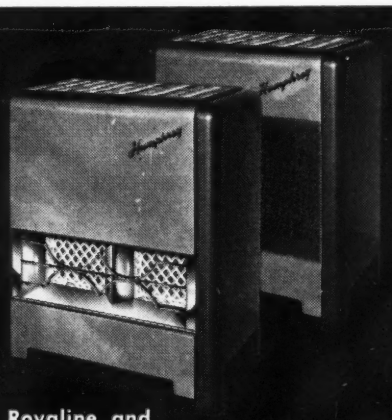
It sells readily at a full, normal mark-up, and the demand is steady. It can be installed quickly and easily. Customer satisfaction is high, because this equipment gives a large volume of heat, at remarkably low cost. Most important of all, Humphrey heating equipment gives dependable, trouble-free service, year after year. Thus, every Humphrey Heater in service is a permanent good-will builder that continuously creates new business for your store.

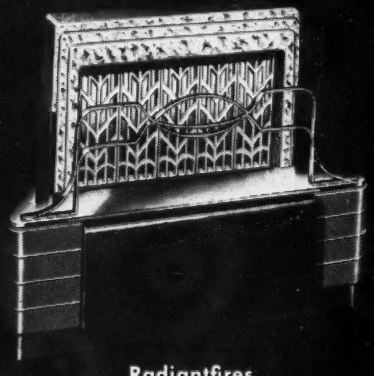
GENERAL GAS LIGHT COMPANY
KALAMAZOO
MICHIGAN

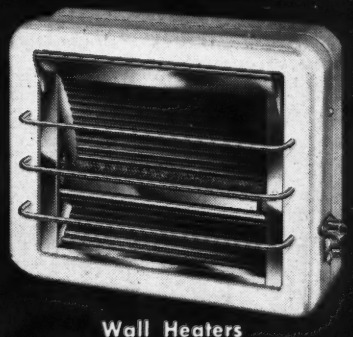
HUMPHREY PRODUCTS



Automatic Gas Unit Heaters


Royaline and
Radiantfire Circulators


Radiantfires


Wall Heaters

Financing Delays Purchase

Commonwealth Natural Gas Corp., Charleston, last month was given until Aug. 8 to decide whether it wants to purchase the assets of Petersburg (Va.) & Hopewell Gas Corp. and form a subsidiary to serve customers in the Petersburg-Hopewell area.

On that date a board meeting was to be held at which the company would determine whether the required funds can be raised. Terms of the contract have been agreed upon by both companies, and the delay is caused only by the financing.

The Petersburg utility is planning some expansion of its own, but if Commonwealth takes it over, a more extensive, $300,000 improvement program will be carried out.

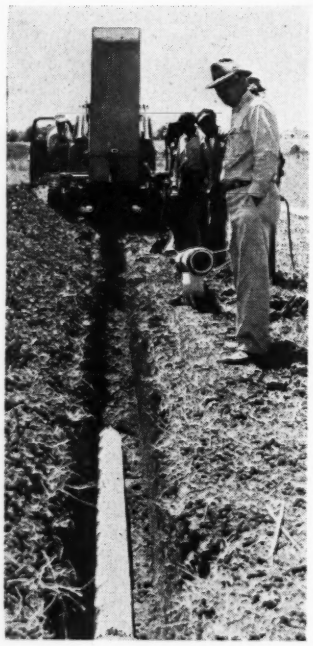
No Stock for Employees

Rochester (N.Y.) Gas & Electric Co. has dropped its plan to sell 50,000 shares of common stock to its officers and employees because of Wage Stabilization Board complications.

In a revised registration with the SEC, the company said it will offer 175,000 shares to stockholders. Originally, the plan was to sell 150,000 shares to stockholders and 50,000 to employees.

PEWTHERS' "EARTHRIPPER"

OPENS THE EARTH LIKE A ZIPPER!



ECONOMICAL... Pewther's EARTHRIPPER saves money three ways! It costs less—it's speedy operation saves labor costs . . . and standardization of automotive parts cuts down maintenance costs. Construction engineers who use the Pewthers' EARTHRIPPER have found that it costs only 4c a foot to operate. This low cost covers initial investment, depreciation, operation, maintenance, and labor over a three-year period! With an EARTHRIPPER, one man can handle your ditching problems, from driving the machine to the ditch site to lowering the boom and opening the earth at a maximum rate of twenty feet a minute! Because all gears run in oil, the EARTHRIPPER can be used for years with few replacements of parts. If you want to save time and money, invest in an EARTHRIPPER today.

MOBILE... The EARTHRIPPER is versatile because it is mobile. On the highway its speed is the speed of the truck. The raised boom clears telephone wires and tree branches, making transit easy and speedy, even in heavy city traffic. The EARTHRIPPER digs vertical ditches in any kind of terrain under almost any digging conditions. On slopes the frame levels. While the tires follow the contour of the earth, the ditcher digs a vertical ditch! If you need a ditcher for large or small ditching jobs, the EARTHRIPPER can solve your problems.

EFFICIENT... For straight, clean ditching, the answer is Pewther's EARTHRIPPER. This new, unique ditcher offers a complete different design. It is the first ditcher to be built into a truck. Bucket design saves time because there is no loss of time in cleaning. Bottom of each bucket forms the top of the preceding one. The buckets separate as they go over the top sprocket, throwing the dirt onto the conveyor belt. Conveyor belts throw the dirt on either side of the ditch and can be reversed on a moment's notice. In competition the EARTHRIPPER digs straight ditches with clean sides . . . in record time.

Pewther's "EARTHRIPPER" is the only ditcher built into a truck. This means *one man* can handle your ditching job, from driving the machine to the ditch site to opening the earth to a maximum depth of five feet. The EARTHRIPPER is particularly suited for gas lines, extensions and house-to-street service lines. Utility ditching requiring ditches 10", 14", or 18" wide are duck soup to this new, *different* Pewthers' ditcher.

Send for the folder on the new Pewther's ditcher, the EARTHRIPPER. Learn for yourself how the EARTHRIPPER can save time and money on any small ditching job! Ask for a demonstration before purchase . . . at any point in the United States!

I want the new folder on the Pewther's "EARTHRIPPER."

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

I saw this ad in the above magazine.

PEWTHERS DITCHER COMPANY

3530 MANSFIELD ROAD • SHREVEPORT, LOUISIANA

Sales and Promotion

A. O. Smith Selects Top Water Heater Sales Ideas

Sales ideas have paid off for 10 winners of A. O. Smith Corp.'s (Milwaukee) Permaglas water heater contest. Top award—a $1000 U.S. savings bond—went to Millard D. Sims, Alabama Gas Corp., Talladega, Ala., for an idea built around the sales advantage of a glass-surfaced water heater tank.

M. D. Sims

Jack Chilcutt, New Home Building Stores, Columbus, Miss., won second place and a $500 bond by concentrating his selling efforts on replacement of water heaters in homes built during the last war. "Pitchman selling" in a carnival atmosphere won third prize and a $250 bond for Charles Palladino, N. Palladino & Bros., Pottstown, Pa., and a $125 bond award was presented to Harry Bolno, V. Day Appliances, Philadelphia, for his plan of making second calls on customers who had previously bought other appliances.

Other winners were Elmo C. Pierson, Hutchinson (Kan.) Butane Co., $100; Charles D. Moseley Jr., Moseley Bros., Lynchburg, Va., $75; Mary E. Christensen, Paul's Plumbing & Heating, Pocatello, Idaho; Carl Keller, Keller's Gas Corp., Eagle River, Wis.; R. J. Bloomquist, Chequamegon Oil Co., Ashland, Wis.; and Arnold E. Haskins, Coastal Radio Service Co., Riegelsville, Pa., $50 each.

A. O. Smith distributors and salesmen in the winners' territories also received prizes.

June Range Shipments Dive

June shipments of domestic gas ranges reached 113,300 units, down 47.8% from June 1950, and continuing a trend begun in May (see *GAS*, July, p. 50). For the first half of 1951, range shipments totaled 1,315,400 units, 1.6% less than 1950's first half, GAMA reports.

Gas-fired central heating equipment shipments for May, recently released by GAMA, show that 37,000 units were shipped during the month: furnaces, 22,700; boilers, 3500; conversion burners, 10,800. For the first five months, 245,700 central heaters were shipped: 161,900 furnaces, 28,600 boilers, and 55,200 conversion burners.

Six-Month Sales Campaign

Employees of Lone Star Gas Co., Dallas, are now well into a six-month "nut cracking" sales drive begun July 1 and designed to "crack" buyer resistance. Chester L. May, vice president, outlined the campaign at a series of company meetings.

"We have let buyers' resistance and regulation W get the best of us," Mr. May said. "We had been selling terms before; now we must sell despite higher down payment and shorter terms. Never has there been a harder job facing us or more at stake."

AMERICAN-Standard

First in heating...first in plumbing

The AMERICAN-Standard Better Retailing Plan

...how it benefits gas companies

■ The American-Standard Better Retailing Plan shows heating retailers how to develop a modern store . . . how to get better advertising results . . . how to increase their personal selling effectiveness.

Participating retailers will do a better job of selling and promoting gas heat. Because American-Standard makes it possible for them to do more aggressive selling for less money.

For example, they can get substantial discounts for the display of American-Standard gas heating equipment; special cooperative ads on gas heating products for use in local newspapers; a packaged direct mail program exclusively on gas heating; trade-mark advertising in telephone directories, and many, many other important selling aids.

The American-Standard Better Retailing Plan works for heating retailers . . . and it works for you. It means more gas heating equipment will be sold in your community . . . and every American-Standard gas unit sold means another satisfied customer along your mains.

That's why you will find it good business to work closely with alert heating retailers who sell American-Standard gas products.

American Radiator & Standard Sanitary Corp., P. O. Box 1226, Pittsburgh 30, Pa.

LOOK FOR THIS MARK OF MERIT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Expanding Services

Florida, New York Firms To Convert Systems

Brooklyn Borough Gas Co. has received a green light from the New York Public Service Commission to convert its system from manufactured to natural gas. The firm serves about 98,000 customers in Coney Island, Sheepshead Bay, and parts of Bensonhurst in Brooklyn. Preliminary work on customer appliances is to begin Aug. 6; conversion will be completed between Oct. 1 and Nov. 30. The company plans to submit a proposal for reduced rates and a new rate structure when the work is finished.

The New York commission has also okayed a switch to natural in the Utica and eastern division territory of Niagara Mohawk Power Corp., Syracuse. The changeover, to be made as soon as the distribution system is ready, is expected to result in a 10% rate reduction which would save consumers some $350,000 a year. Communities included in this project are Utica, Rome, Troy, Albany, Schenectady, Saratoga Springs, Glens Falls, Amsterdam, Johnstown, and Gloversville.

Niagara Mohawk has sold its coke-producing facilities at Troy to Republic Steel Corp. Transfer of the property is to become effective when the conversion finished.

The Modern Meter Cover

Zenaloy*

RESIDENTIAL METER AND REGULATOR COVER

. . . Prevents Regulator Vent Freeze-up

. . . Impervious to all weather conditions

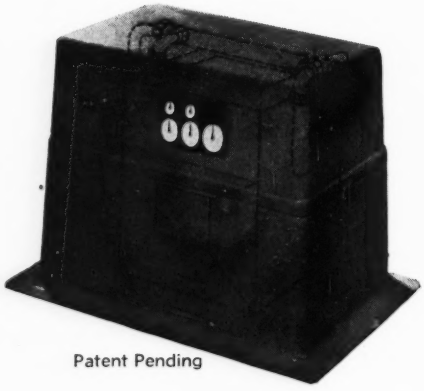
. . . Cannot rust or warp

. . . Reduces meter and regulator maintenance costs

. . . Designed for nesting to simplify storage problems

. . . Light weight

. . . Attractive in appearance



Patent Pending

GORDON Z. GREENE CO.

MANUFACTURERS OF OIL AND GAS SPECIALTIES

TUcker 1279

2335 EAST EIGHTH STREET, LOS ANGELES 21, CALIFORNIA

Write for Prices and Delivery information

also

Information concerning: "Kraloy" Insulating Bushings, "Kraloy Plastic Tubing, "Vulcan" Synthetic Gas Meter and Regulator Diaphragms, "Commercial" Orifice Metering equipment and "Tiltback" Orifice Meter House.

In Florida, the railroad and public utilities commission has granted Peoples Water & Gas Co., Miami, authority to substitute oil gas of not less than 709 Btu for its present 525-Btu carbureted water gas. Cost of the change is estimated at $665,000, of which $180,000 will be spent in converting appliances. The utility serves 15 communities.

Test Facilities Expanded

Roots-Connersville Blower Corp., Connersville, Ind., is undertaking a $1.5 million construction program covering a new erection floor and expansion of test facilities, manufacturing space, and machine tools.

Purpose of the project, announced recently by Dresser Industries Inc., is to enable Roots-Connersville to test the largest centrifugal blowers and compressors ever designed. The installation will consist of six units, one of which will require a load of 56,000 hp on a single shaft.

The company believes that compressors of this size and type may open up large-scale industrial developments.

Stripping Plant Proposed

Negotiations are under way for the purchase of a 500-acre site near Tuscola, Ill., for a $38 million plant to manufacture products from natural gas. The site is sought by National Petrol-Chemical Corp., recently organized by Panhandle Eastern Pipe Line Co., Kansas City, and National Distillers Products Corp., New York.

Plans are to extract propane, butane, ethyl chloride, natural gasoline, and other products and then to return the gas to the line. About 400 MMcf a day, or 30% of the gas, would be consumed. The process would cause only a very slight reduction in Btu of the gas.

Boilers to be Gas-Fired

Installation of gas-fired steam boilers to replace coal-fired steam boilers and compressors is planned for the Plainfield and New Brunswick gas holder stations of Public Service Electric & Gas Co., Newark, N.J.

Pumping engines housed in the Plainfield station, which has not been operated for some time, are being removed to make room for the gas boilers which will heat the gas holder and distribution shop. The New Brunswick station will be operated only during winter peak load periods, and the building there is being remodeled to accommodate three gas-fired boilers.

New Home Service Personnel

Eleven women have joined Gas Service Co., Kansas City, Mo., as permanent members of the home service department and 18 others have been added as apprentice members. All have been assigned to various company properties and are working under the supervision of home service directors.

The permanent employees were graduated last spring from various colleges in the company's area. Apprentices have finished their junior years in college and accepted a two-month training assignment under Gas Service Co.'s home service summer training program.

Now you can get American Blower Gas-Fired Unit Heaters

The development of the Unit Heater has played an important role in America's heating progress since the day of the potbellied stove.

Now you can get American Blower Gas-Fired Unit Heaters that are self-contained (require no central heating plant), pleasing in appearance, and provide maximum heating value, comfort and convenience.

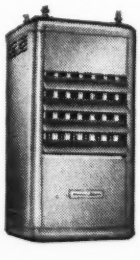
These new units have many advantages—better heat . . . quicker heat . . . cleaner heat. They occupy less space . . . and cut fuel costs.

They are built to last, with an aluminized steel combustion chamber and heat exchanger welded together into one rugged, leakproof assembly. Interchanger tubes are of dimpled design to prevent warm-up noises.

American Blower Gas-Fired Unit Heaters are A.G.A. approved and carried in stock for the convenience of your customers.

Data on American Blower Gas-Fired Unit Heaters is available from Heating Supply Houses, Heating Contractors or the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
Division of AMERICAN RADIATOR & STANDARD SANITARY CORPORATION



American Blower Gas-Fired Unit Heaters are available in 7 sizes with capacities ranging from 70,000 to 230,000 Btu/hr. input. Write for Bulletin 7117.

YOUR BEST BUY!

AMERICAN BLOWER

UNIT HEATERS

Gas-Fired Models • Models for Steam or Hot Water

Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER
CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

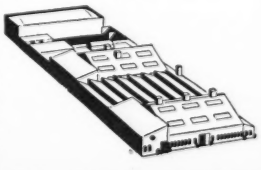
A FINE NAME IN WATER HEATER *Thermostats*

Utility

1. ***Long Trouble-Free Service Life***
2. ***Thermostat and Valve Available Separately***
3. ***Ruggedly Built***
4. ***Few Parts and Easily Accessible***
5. ***Built to Last***
6. ***Tube Lengths 4⅜, 6½ and 8½ in.***

In over twenty years of building gas controls we have never offered a product which so rapidly gained national acceptance. For Water Heater Thermostats on which you can DEPEND, specify UTILITY.

Certified by A.G.A.



THE UTILITY CONTROL COMPANY FACTORY

Utility CONTROL COMPANY

832 EAST 108th STREET • LOS ANGELES 59, CALIFORNIA

Newsnotes

Life-saving and other personal acts beyond the normal requirements of their jobs have won meritorious service certificates for 13 employees of Consolidated Edison Co. of New York Inc. The new awards bring to 1065 the number made since the plan was established 25 years ago.

Columbia Gas System Service Corp. is the new name for the former Columbia Engineering Corp., subsidiary service company of the Columbia Gas System Inc.

A national advertising campaign to further development and expansion of the Philadelphia area is being sponsored by Philadelphia Electric Co. Its aim is not only to attract new industries, but also to promote the advantages of the area as a good place to live and to work. A series of color ads in national magazines began late in June.

Last month FPC issued an order, effective immediately, amending its regulations under the Natural Gas Act relating to requirements for filing applications for authorization to export or import gas. The amendment eliminates the requirement that the owner of a source of supply of natural gas, who proposes to export or import gas or who has entered or expects to enter into a contract to supply gas to be exported or imported, must be a party to the application.

FPC has denied a motion by Mississippi River Fuel Corp., St. Louis, requesting permission to make its proposed $3.1 million annual rate increase, now under commission suspension, effective for all gas billed after June 1, 1951. The increase, which would affect eight wholesale customers, was suspended in March until Sept. 1 and thereafter until it may become effective under the Natural Gas Act. Hearing is set for Sept. 5.

West Texas Gas Co., Lubbock, has asked the Texas Railroad Commission for permission to raise its rates in 47 communities including Plainview, Lubbock, Levelland, Midland, and Odessa. Olin Culberson, chairman, said the commission has only appellate jurisdiction and will take no action unless one of the communities rejects the increase or waives original jurisdiction.

A rate schedule which will result in a $122,000 annual reduction for Philadelphia Electric Co. sales in interstate commerce has been accepted for filing by the FPC. A changeover from 520- to 800-Btu gas, to be completed about Aug. 1, is responsible for the reduction. The new schedule will replace three cost of service arrangements covering sales to Delaware Power & Light Co., Wilmington; Consumers Gas Co., Reading, Pa.; and Chester County Light & Power Co., Philadelphia.

To simplify its structure, the Scranton-Spring Brook Water Service Co., Wilkes-Barre, Pa., is seeking SEC approval of a proposed merger with two subsidiaries. They are the Carbondale (Pa.) Gas Co. and Wyoming County Gas Co., Wilkes-Barre.

The Utah Public Service Commission has granted Mountain Fuel Supply Co., Salt Lake City, an increase in natural gas rates to add $1,760,096 to annual operating revenues. Rising wages and operating expenses had reduced the firm's rate of return on capital investment to 5.19%, and the new hike is to bring the return to 6% and to permit an accelerated drilling program.

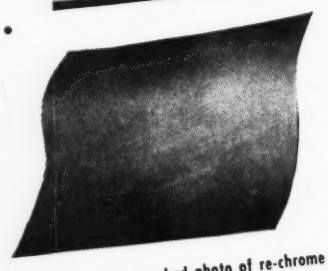
MidSouth Gas Co.'s second common equity financing within a year was made last month with the offering of 100,000 shares of common stock. Proceeds will be used for the current expansion program.

Brooklyn (N.Y.) Union Gas Co. last month denied charges by a U.S. attorney that it was guilty of polluting tidal waters. Specifically, the company was charged with failing to correct oil seepage from a defective bulkhead and also from an oil separator installation at its Gowanus Canal plant.

Construction of new general offices and plant facilities for Crane Packing Co., Chicago, is currently under way near Lehigh in Morton Grove, Ill. When completed, the structure will cover 133,000 sq ft. Increased production of its packings and seals is anticipated by the firm.

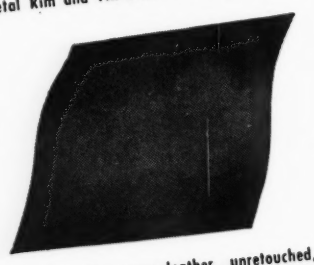
PARBOILED for 15 minutes to show you why . . .

BEFORE—Unretouched photo of bark tanned leather.



BEFORE—Unretouched photo of re-chrome leather used exclusively in all Lancaster Metal Rim and Tin Meter Diaphragms.

AFTER—The same leather, unretouched, after boiling for 15 minutes. See how it has shrunk in size and become wrinkled. The fine fibers between inner and outer skin are broken and lifeless. All pliability is gone and it is now hard as rock.



AFTER—The same leather, unretouched, after boiling for 15 minutes. Notice how the re-chrome leather is still pliable and drapes over the supporting block underneath. There are no wrinkles, and the fine fibers between inner and outer skin are still spongy and "alive."

LANCASTER GAS METER DIAPHRAGMS

Last Longer

METAL RIM DIAPHRAGMS

Gas meters are seldom boiled—but this is a quick way to show a big reason why Lancaster Gas Meter Diaphragms give so many more years of service.

Re-chrome leather is used exclusively by Lancaster. It is the finest grade virgin lamb skin, specially tanned to retain the soft, pliable qualities and assure longer life. As extra protection, LMPCO diaphragm oil stays in the leather over a 10 year period.

Write for samples and literature today.

Lancaster METER PARTS CO.

POST OFFICE BOX 378 LANCASTER, OHIO

General offices of Caloric Stove Corp. have been moved from Philadelphia to temporary quarters in Topton, Pa., where the firm has broken ground for a modern administration building. The Caloric plant is also located at Topton. General and private offices, an auditorium, dining room, and experimental kitchen will occupy the 10,000 sq ft of floor space.

A five-man "watchdog" committee has been set up by the Texas Independent Producers & Royalty Owners Assn. to investigate producer claims of discrimination or inequity in natural gas prices. The association's action followed failure of a bill which it sponsored in the state legislature. The measure would have allowed the railroad commission to fix field prices where conservation would result.

New sales offices have been opened in Salt Lake City and Phoenix for U.S. Steel Supply Co., warehousing subsidiary of U.S. Steel Corp. Two former Los Angeles salesmen for the warehouse company will head the new offices. Donnell Newman will cover Utah and southern Idaho from Salt Lake City, and Albert M. Loomis' territory will include Arizona and New Mexico and El Paso county, Texas.

"Allotment Accounting for Consumers Under CMP" is an 18-page booklet prepared by the National Production Authority, Department of Commerce, to assist companies operating under the Controlled Materials Plan in setting up records and preparing forms required.

On July 5 natural gas was turned into the burners of 15% of Consolidated Edison Co.'s customers, and a 600-man crew began converting appliances of 207,000 gas users in Westchester county, N.Y. The event marked the beginning of the last phase of ConEd's $5.3-million switch to natural.

Recent appointments by Oscar L. Chapman, secretary of the interior, included those of Harry H. Johnson, president of Algonquin Gas Transmission Co., Boston, as a member of the Gas Industry Advisory committee, and of A. Dale Greene, vice president of United Gas Pipe Line Co., Shreveport, as director of PAD's gas operations division.

Ohio Pump & Service Co., Cleveland, has been named the first of a proposed series of service outlets to handle repairs and replacement of gas controls for A-P Controls, Milwaukee. The Wisconsin firm also plans to conduct an educational campaign for utility servicemen. A training school of this type was held recently at East Ohio Gas Co., Cleveland.

A demonstration-scale retort for the continuous extraction of oil from shale is to be built at Rifle, Colo. for the Bureau of Mines by the Chemical Plants Division, Blaw-Knox Co., Pittsburgh. The bureau awarded a $333,870 contract for the plant, which will process from 150 to 400 tons of oil shale daily by a new gas-combustion retorting process developed at Rifle by the bureau.

Brooklyn (N.Y.) Union Gas Co.'s new business department recently announced that appliance dollar sales during the first five months of 1951 reached $2,887,469.96, up 40% from the total for the same period last year. During the month of May, however, sales declined 6% from May 1950.

"An Introduction to Human Relations in Business and Industry" is the title of a new sound slide film which presents a method of supervisory training prepared by Dr. Nathaniel Cantor, University of Buffalo. The film will be loaned to readers of *GAS* upon request to the firm which produced it: Human Relations for Industry, 443 Delaware Ave., Buffalo 2, N.Y.

Rheem Manufacturing Co., New York, has announced plans to purchase the oustanding capital stock of James Graham Manufacturing Co., Newark, Calif., 69-year-old manufacturer of Wedgewood gas ranges. The firm will continue under the management of Clarence Graham Sr., president. Purchase price, according to a Rheem spokesman, is based on a total value of about $3 million and involves payment of cash and common stock.

More than 4400 shareholders in Consumers Power Co., Jackson, Mich., gave evidence of their interest in the growth and progress of their investment by turning out for the company's recently concluded series of regional stockholder meetings. The number

Q.E.D.
if you remember your mathematics, "Q.E.D." means "which was to be proved." In Welsbach-Kitson Gas Stops and Meter Connections, "Q.E.D." stands for Quality, Economy and Durability. The long life and quality built into these fine products . . . "which was to be proved" . . . has been proved through years of constant use by regular Welsbach-Kitson customers!
Q E D
WELSBACH-Kitson
G-501
GAS STOP
Iron Body—Service Pattern Flat Head
G-452
HIGH PRESSURE SERVICE GAS VALVE
Tamper-Proof
K-700
METER CONNECTION
With Built-in Lock Wing Gas Stop
WRITE NOW FOR CATALOG AND PRICE LIST
The WELSBACH CORPORATION
1500 Walnut Street
Philadelphia 2, Pa.

represented 20% of the total number of stockholders living in Michigan. During the three years the meetings have been held, their number has increased from four to 10.

"Sell Solid Comfort" is the title of a new proofbook prepared for Janitrol gas heating equipment dealers by Surface Combustion Corp., Toledo. Theme of the book, designated JS-169, is stimulating heating equipment sales with modernization and upgrading.

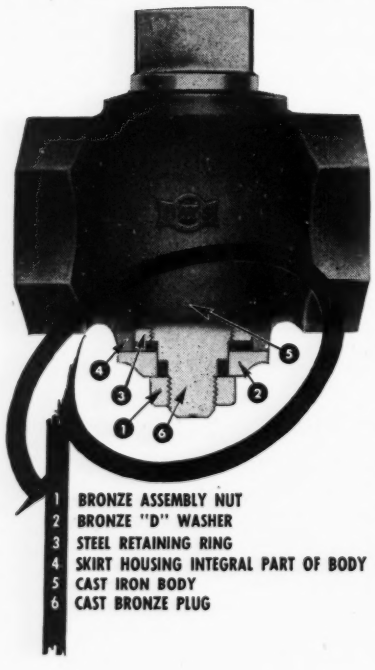
Appointment of the Dykes Co. Inc., Shreveport, as distributor for northern Louisiana and part of Texas and Arkansas has been announced by Bryant Heater Division, Affiliated Gas Equipment Inc. The firm, headed by O. J. Dykes Jr., will also maintain showroom and service facilities.

Expansion of its operations at Tulsa to include complete engineering and construction services for the petroleum, gas, chemical, and process industries of the Southwest has been announced by the Chemical Plants Division of Blaw-Knox Co., Pittsburgh. The Tulsa staff has now been increased to 50 trained engineers, headed by H. V. Williams, formerly of the Chicago office, and Charles B. Barry, whose appointments as manager and chief engineer respectively at the Oklahoma location were also announced.

HAYS®

TAMPER-PROOF GAS STOPS

FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Located below Shoulder of Body—Permits Freedom for Service Adjustment of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
- Obtainable in a Variety of Patterns.

Write for Folder 120-C D

AVAILABLE IN

Black or Galvanized

Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing

Sizes; ¾"—1"—1¼"—1½"—2"

Also HAYS STANDARD
HEAVY PATTERN IRON BODY GAS STOP

For 75 Years the Gas Industry has relied on HAYS Iron Body Gas Stops

CURRENT READING

AMERICAN STANDARD CODE FOR PRESSURE PIPING—(ASA B31.1-1951). Sponsored and published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18.

To meet the need for a national code for pressure piping, the American Standards Assn. initiated project B31 in 1926 at the request and under the sponsorship of ASME. In 1935 sectional committee B31 and its subcommittees published an American Tentative Standard Code for Pressure Piping. A revision was begun in 1937 to secure uniformity and to keep the code abreast of new developments. A section on refrigeration piping was added, and the work culminated in a new code in 1942. Supplements were issued in 1944 and 1947, introducing new dimensional and material standards, a new formula for pipe wall thickness, and more comprehensive requirements for instrument and control piping. Procedures were set up for handling and publishing inquiries.

By 1948 the need for extensive changes in the code and for reorganization of the working committee was recognized. Some 30 or 40 engineering societies, government bureaus, trade associations, institutes, etc., have representatives on the sectional committee, plus "members at large" and "corresponding members."

Following the 1948 reorganization, sectional committee B31 reviewed the 1942 code and accomplished the following: (1) A general revision and extension of requirements to agree with present day practice; (2) revision of references to existing dimensional standards and material specifications and addition of references to new ones; and (3) clarification of ambiguous or conflicting requirements. The final revision was approved by the committee, ASME, and ASA and was finally designated an American Standard in February 1951.

AGA REFERENCE BOOK on Corrosion Instruments—Prepared by Subcommittee on Instrumentation of the Corrosion Committee. Instruments and equipment for electrolysis, corrosion, and cathodic protection testing are covered in this 48-page text written in non-technical language.

Among subjects discussed are characteristics and use of corrosion testing instruments, high-voltage inspection of pipeline coatings before burial, location of coating faults on buried pipelines and cables, a vacuum tube voltmeter for corrosion testing, electrolysis meter with resistance compensating network, multi-combination meters, and pH measurement of soils and water.

Indexed manufacturers' catalog sheets are included, and AGA and manufacturers will prepare additions and revisions of the text which will be sent to all owners of the reference book. A limited supply is available from AGA headquarters. Price: $1.50.

PRICE LIST OF AMERICAN STANDARDS—Published by the American Standards Assn., 70 E. 45th St., New York, N.Y. The more than 1180 standards listed include 99 new and revised ones which are given for the first time. Among the new standards is one on gas water heaters.

PROCEEDINGS OF THE SECOND ANNUAL INSTITUTE on Oil and Gas Law and Taxation as it Affects the Oil and Gas Industry—Sponsored by the Southwestern Legal Foundation, Dallas. Published by Matthew Bender & Co. Inc., Albany, N.Y. The articles presented in this 555-page book formed the basis for lectures delivered during the three-day institute held last January in Dallas. They have been expanded beyond lecture form, and footnotes and other addenda are included. In addition to the substantive and tax aspects of oil and gas law, the manuscripts deal with the history and development of the modern oil and gas lease, problems of interpretation, and other legal problems arising out of the "Producers' 88" form of lease.

WAGE STABILIZATION RULINGS—By Benjamin Werne, Graduate School of Business Administration, New York University. The rulings contained in this publication are intended to assist in solving various wage problems all over the country. Each point discussed includes a reference to the Wage Stabilization Board general regulation concerned.

THE STRANGE CASE OF THE SEVEN-SIDED POST HOLE—American Standards Assn. Inc., 70 E. 45th St., New York 17. This whimsical cartoon-type booklet effectively conveys some basic ideas about industrial, consumer, and safety standards through the story of how standardization benefited the mythical "post hole" industry.

SAFETY RULES FOR PIPELINE CONSTRUCTION—Published by H. C. Price Co., Bartlesville, Okla. This 20-page booklet is a revised edition of the one first published in 1948.

Increased activity in the oil field and industrial services offered by Dowell Inc., Tulsa, has resulted in the construction of this modern office building on the site where the company already has its truck, magnesium anode, and chemical manufacturing plants, warehouse, and engineering research laboratories.

Oxyment, a new Dowell cement manufactured from sea water, has been used for the exterior and floors of the building. This is the first large-scale commercial use of the product.

The firm's purchasing, accounting, auditing, engineering, and maintenance departments occupy the 11,000 sq ft of floor space in the new structure. Future plans call for addition of a second floor and a wing. All interior walls of the building are movable.

THE NORMAC
BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

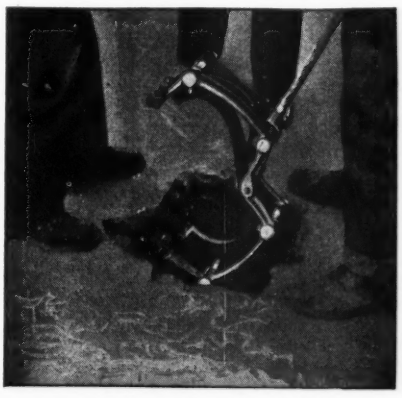
Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.



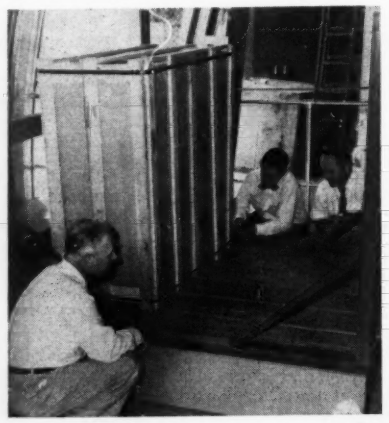
6 inch Normac Clamp being lowered into hole for installation

6 inch Normac Clamp in service after installation

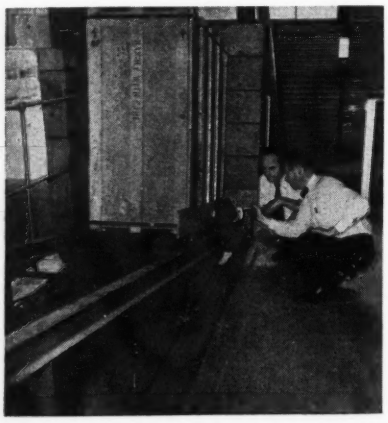
NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS

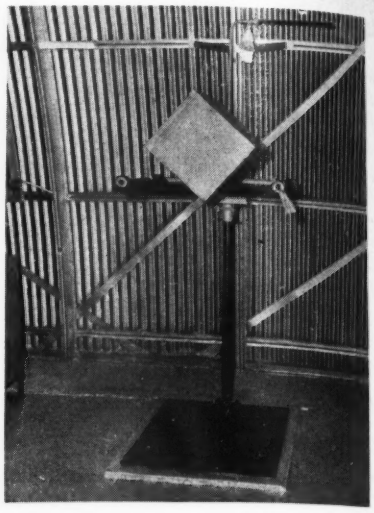
Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.



W. H. Vogan and Pieter Root Jr., labmen, and E. M. Brickey (right), Fraser & Johnston Co., examine crated appliance during vibration test.



Mr. Brickey (left) and Mr. Root check the R-S ride recorder mounted on a crated furnace during conduct of impact test.



Packaged accessories mounted on Acme drop tester for parcels weighing less than 100 lbs.

AGA Laboratories Certified for Packaged Products Testing Program

In April the AGA Laboratories' Pacific coast branch in Los Angeles was established as "certified safe transit laboratories" by the National Safe Transit Committee of Washington, D. C. Crated appliances are now being tested for compliance with the rigid standards of the national committee.

The new setup is the only one of its kind west of Chicago. Equipment installed includes an L.A.B. package tester (vibration test), Conbur incline testing device (impact test), Acme drop tester (for packages under 100 lbs in weight), and an R-S ride recorder. Packaged parts and accessories will be handled, as well as crated appliances.

Interest in the safe transit program was created among gas appliance manufacturers through discussion at meetings of the Pacific Coast Gas Assn.'s manufacturers section. This PCGA group obtained the necessary equipment for installation at the laboratories.

Over 60,000,000 ft. in service!
Johns-Manville Transite* Flue Pipe has for nearly 20 years enjoyed a reputation for dependable, economical service in thousands of installations. Proof of its many practical advantages is shown by the fact that there are more than 60,000,000 feet of this asbestos-cement pipe in use!
For complete details, write for folder TR-84A. Address Johns-Manville, Box 290, New York 16, N. Y. *Reg. U.S. Pat. Off.
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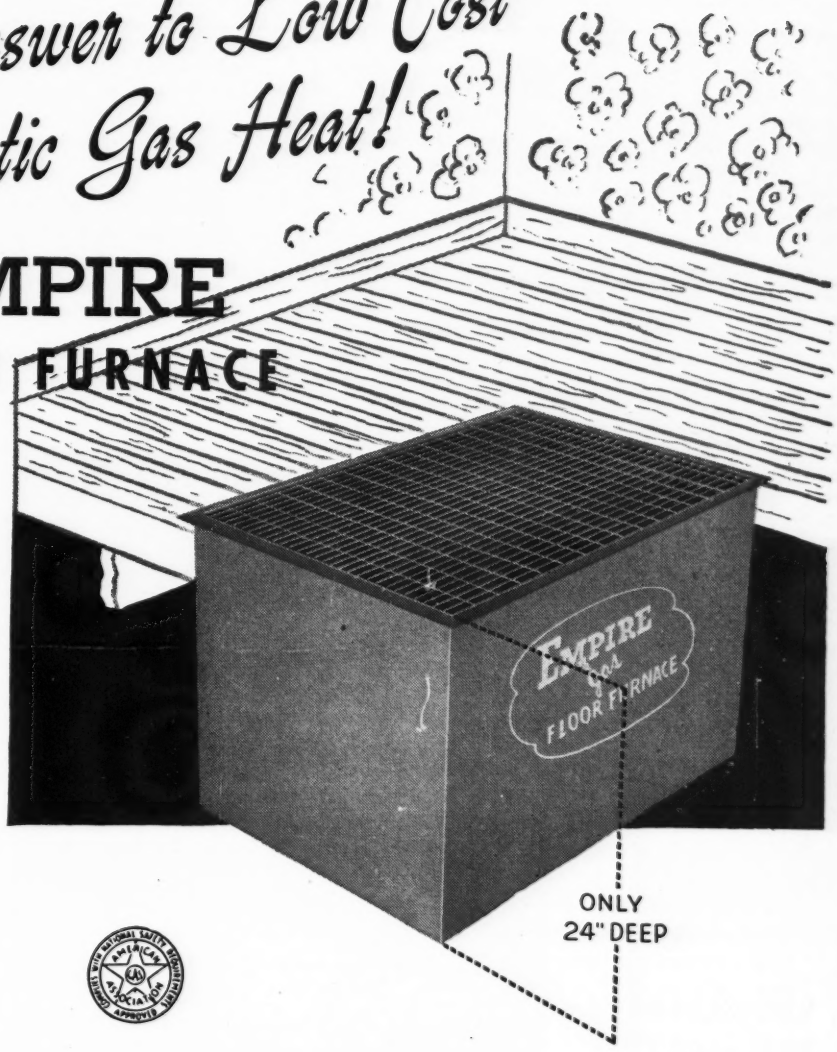
PRODUCTS
Johns-Manville TRANSITE FLUE PIPE
FOR VENTING DOMESTIC GAS-BURNING APPLIANCES

Here's the answer to Low Cost Automatic Gas Heat!

EMPIRE
FLOOR FURNACE

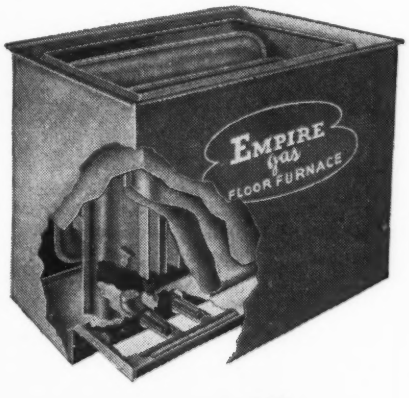


CHOICE OF 4 MODELS

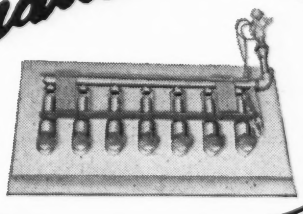
Here's FOUR outstanding Empire Floor Furnaces to help you solve your customers heating problems. Each model, 25,000 B.T.U., 35,000 B.T.U., 50,000 B.T.U., and 70,000 B.T.U., extends only 24 inches below the floor level . . . requires no basement, no extending ducts or expensive excavating cost.

EASIER SALES
EASIER INSTALLATION
EASIER SERVICE

Empire Floor Furnaces are skillfully designed, scientifically engineered and produced of the finest materials to insure the utmost in silent, efficient operation at a low initial cost, low operating cost.



EQUIPPED WITH THE *famous* EMPIRE *"Thriftmatic"* Gas BURNER



Operates efficiently, economically on natural, manufactured or L-P gases.

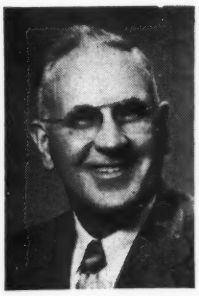
EMPIRE STOVE COMPANY • BELLEVILLE, ILLINOIS

PEOPLE

Appointment of GEORGE E. PAYNE as Des Moines sales representative has been announced by Cribben & Sexton Co., Chicago. He was previously covering Nebraska for Geo. D. Roper Corp. C. T. DUKES, salesman for Cribben & Sexton for the past 15 years, will head LP-Gas sales promotion in the Midwest division.

Transfers and promotions necessitated by the recent resignation of C. H. HORNE as vice president in charge of sales, Alabama Gas Corp., Birmingham, included appointment of J. H. CHENERY as general sales manager; H. G. CRUNK to replace Mr. Chenery as manager at Selma, Ala.; and N. T. OVERALL as superintendent at Tuscaloosa, replacing Mr. Crunk.

Tappan Stove Co., Mansfield, Ohio, recently announced the promotion of GEORGE E. CONNALLY, former eastern Pennsylvania sales representative as district manager and the appointment of PHILIP M. GRESH, formerly with Atlantic States Gas Co., as Mr. Connally's replacement.



Harold Ames
... Drake & Townsend

Charles Bulloch
... A. O. Smith

HAROLD AMES recently became associated with Drake & Townsend Inc., New York. He will reside in Centralia, Ill. and will have charge of propane plant installations in the Midwest. Mr. Ames has been connected with the gas industry for 27 years, for the past eight years specializing in the installation of LP-Gas plants in the U.S. and Canada. Previously, he had charge of water gas plants and installed low- and high-pressure distribution systems.

CHARLES E. BULLOCH joined the water heater division, A. O. Smith Corp., Kankakee, Ill., on June 1 as assistant to S. E. Wolkenheim, marketing director. Mr. Bulloch will handle special assignments in sales promotion and dealer relations.

JANET CHETLIN recently was appointed director of home service publications for the Pittsburgh Group, Columbia Gas System. She joined Manufacturers Light & Heat Co. as a staff assistant in 1949. Two home economists have been added to the Manufacturers Light & Heat staff—JOAN McKNIGHT, who will headquarter in East Liverpool, Ohio, and KATHARINE SMITH, who will be located in Connellsville, Pa.

In recognition of his work in the development of standards, CLARENCE H. WARING, vice president, The Gas Service Co., Kansas City, Kan., was recently awarded a certificate of service by the American Standards Assn. Mr. Waring represents the AGA on the ASA standards council.

Appointments recently announced by Rockwell Manufacturing Co., Pittsburgh, include those of ORVILLE COCHRAN as supervisor of gas products and Nordstrom valves in the Rocky Mountain area, JOHN B. LINK as valve engineer in southern California, and GEORGE G. BLEDSOE as sales engineer of industrial accounts in the Chicago territory. Mr. Cochran has been affiliated with Rockwell for more than 25 years.

Orville Cochran

John B. Link

REYNOLDS HIGH PRESSURE LINE REGULATORS

in parallel hookup have an increased range of capacity as well as a wider range of delivery pressure control. This also provides greater margin for emergencies. On inlet pressure the range is up to 650 pounds. For outlet pressure, this unit assures absolutely accurate and dependable control from 2 to 100 pounds. This variance in outlet pressure is made by use of different sizes of diaphram cases and further flexibility in the spring type is possible by use of different strength springs.

BRANCH OFFICES

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423 Dwight Building
Kansas City, Missouri

SEIDENGLANZ & CO.
2nd Unit, Santa Fe Building
Dallas, Texas

REPRESENTATIVES

EASTERN APPLIANCE COMPANY
Boston, Massachusetts

WALDO S. HULL
163 W. Queen Lane
Philadelphia, Pennsylvania

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

Lone Star Gas Co., Dallas, has announced the appointment of JOE C. DARROW, former superintendent of the Abiline division, as general manager of the Fort Worth division, succeeding F. L. CARMICHALL, who recently resigned. Other appointments include R. H. GRAY, Waco district manager, to succeed Mr. Darrow; GEORGE A. GOTT JR. to the Waco post; EARL W. HEATH to succeed Mr. Gott as Cleburne district manager; W. L. ROUTT to Mr. Heath's former position as Gatesville manager; and FRANK F. WIGGS to replace Mr. Routt as local manager at Killeen.

RAYMOND A. SCHMIDT has been named western division manager for the Dayton (Ohio) Power & Light Co., replacing C. Earl Lakin whose election as vice president in charge of operations was announced several months ago. Mr. Schmidt has been assistant to the president since April 1947. In his new position he will reside in Greenville.

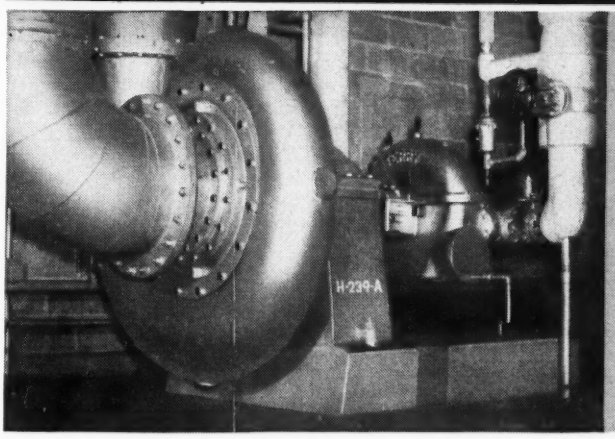
R. A. Schmidt
. . . Dayton

F. W. Thompson
. . . Amer. Natural

Election of FRANK W. THOMPSON as vice president of American Natural Gas Service Co., Michigan Consolidated Gas Co., and Michigan-Wisconsin Pipe Line Co. was announced recently. He will have charge of all rate matters for the three companies. Mr. Thompson has had wide experience in the production and processing of natural gas in the field and has been employed as an engineer by three regulatory commissions—the California and Michigan public service commissions and the FPC. He is the author of a number of engineering articles and wrote the portion of FPC's report on the natural gas investigation relating to reserves and the practices and problems in producing, gathering, and processing natural gas. Early in his career Mr. Thompson was employed by Standard Oil of California, General Petroleum Co., and the Los Angeles Gas & Electric Corp.

Appointment of HARRY C. HILL, former president of Engineering Products Corp., Dallas, as marketing specialist for Motorola Inc., Chicago, was announced last month. He will work in the Southwest with CHESTER L. PRINGLE, Fort Worth marketing specialist since last January.

ARTHUR J. SMITH, consulting gas engineer, builder and designer, has established an engineering and contracting business in Kankakee, Ill. He will build and finance LP-Gas town plants, bulk plants, or handle changeovers. Mr. Smith has devoted most of his life to the gas industry.



CENTRIFUGAL

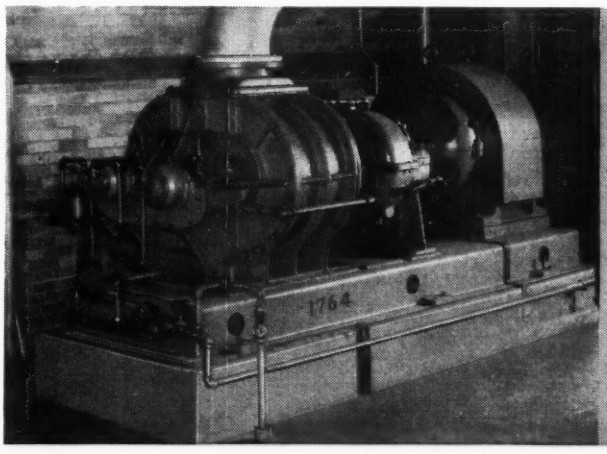
Type OIB Centrifugal Blower used for processing in a large eastern plant. Capacity 12,000 cfm. Similar R-C Blowers are utilized in other plants of this company.

The works manager of a large plant made this friendly statement to a Roots-Connersville representative. What he really meant was that R-C Blowers and related equipment perform so satisfactorily and dependably that they seldom need anything more than routine inspection by his own men.

In large and small plants, in every industry, R-C products uniformly give this kind of reliable operation. They continue to deliver rated capacities, year after year, with a minimum of maintenance—whether a small Rotary Positive Blower of 5 cfm capacity or a Centrifugal unit moving up to 100,000 cfm. And remember, only Roots-Connersville gives you this important dual-choice.

If you are planning a new plant, expansion, or replacements, R-C engineers will work with you to select the equipment best fitted to your needs. Almost a century of experience is at your service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Oregon Avenue, Connersville, Indiana



ROTARY

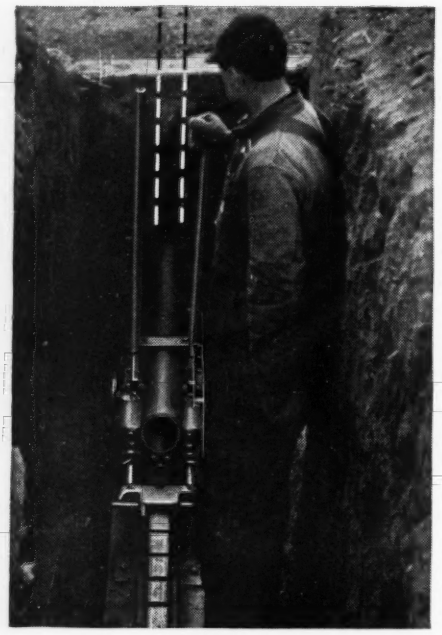
Two, Type RCDH Rotary Positive units used in vacuum service by public utility. Capacities 3,380 cfm and 3,490 cfm, respectively.

ROOTS-CONNERSVILLE
BLOWER BUILDERS R-C SINCE 1854
ONE OF THE DRESSER INDUSTRIES

PUSH PIPE

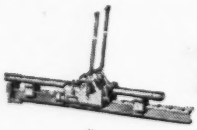
UNDER STREETS, WALKS,

TRACKS, FLOORS



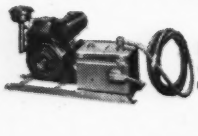
...with a GREENLEE PIPE PUSHER

Yes, here's the quick and simple way to install underground pipe. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe *under* obstacles. No tearing up of pavement, lawns, floors... eliminates extensive ditching as just a short trench accommodates the Pusher. No tedious tunneling, back-filling, tamping, or re-paving. Job time is cut to a fraction. Pusher often pays for itself through labor savings on the first job or two.



No. 790 GREENLEE PUSHER
For 3/4 to 4-inch pipe. Six Speeds—6,500 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER
For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.



POWER PUMP for both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

TOOLS FOR CRAFTSMEN
GREENLEE

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1948 Columbia Avenue, Rockford, Illinois, U. S. A.

Heart Associations Promote Kitchens Designed for Physically Handicapped

Born of the belief that the perfectly designed kitchen is not only an attractive room with efficient gas appliances, but allows the housewife to conserve her strength and save time as well, interest in model kitchens for women with heart trouble or other physical limitations has sprung up across the country.

In Los Angeles, Southern California Gas Co.'s main lobby is displaying the "Heart of the Home" kitchen, planned by the firm's home planning bureau and the city heart association. Main feature of the room is the sit-down work space with gravity sugar and flour bins within reach, built-in waste trap, and tin can chute. "Tutch Latch" cupboards hold foodstuffs, a revolving cabinet houses the mixmaster which never need be lifted, and wheeled carts move dishes, groceries, or entire meals to dining room or patio.

A Servel gas refrigerator has a left-hand door as an extra convenience, and a separate waist-high, Western Holly range is built in.

In Chicago's Women and Children's hospital a similar model kitchen has been installed. The gas home planning bureau of Peoples Gas Light & Coke Co., in cooperation with Dr. Margaret H. Austin, staff cardiologist and member of the local heart association, carried on research which resulted in the "Kitchen for Cardiacs."

Concentrated work centers minimize reaching and stretching, and an upper-level oven is a feature of the Hardwick range. Utensils, tools, and supplies are placed at work centers where they are most often used, and all work spaces and heights are adjusted to accommodate a woman of average height.

Food bar and planning center in kitchen on display at SoCal have telephone, radio, and cookbooks within easy reach.

Upon completion of the kitchen, a seminar was held to explain how to make many of the items shown in the room.

The heart association in St. Louis has been registering cardiac patients for attendance at Laclede Gas Co.'s lecture demonstration series which covers time-and labor-saving in a well-planned kitchen, laundry technique, and practical time-saving methods of housecleaning.

Reaching, bending, and stooping are minimized in this carefully planned kitchen designed by Peoples Gas Light & Coke Co. in cooperation with the heart association of Chicago.

CHESTER A. BLACKBURN, Perfection Stove Co.'s (Cleveland, Ohio) vice president in charge of manufacturing, retired on Aug. 1 He joined the company in 1918 as foreman of the enameling department.

B. J. GREENOUGH, manager of Perfection Stove Co.'s Jersey City sales district, recently retired and has been succeeded by H. C. ERHARD, associated with the company's range and heater division in Cleveland since 1949.

George D. Roper Corp., Rockford, Ill., has announced the appointment of DAN J. SULLIVAN as southern California division manager, headquartering in Los Angeles. Mr. Sullivan joined the company in 1945.

W. K. Grube

W. Paul Jones

W. PAUL JONES, president of Servel Inc., Evansville, Ind., has replaced LOUIS RUTHENBURG as chief executive officer of the company. Mr. Ruthenburg, who will continue as chairman of the board, asked to be relieved of the post because of his duties as GAMA president-elect, AGA executive board member, and other commitments. Servel also has announced the appointment of WILLIAM K. GRUBE as manager of its Chicago sales branch. Mr. Grube has been associated with the company for 17 years, as assistant general sales manager in charge of merchandising since last year.

Three new officers have been elected by McCabe-Powers Auto Body Co., St. Louis. ROBERT J. SONDERMAN, manager of the commercial body division, and R. BROOKE DALY, manager of the utility body division, were named vice presidents and FRANK A. WAGENFUEHR JR. was elected secretary.

H. E. FROME, industrial sales manager for Ohio Fuel Gas Co.'s Zanesville, Ohio distribution district, has been named to the same position for United Fuel Gas Co., Charleston, W. Va. RICHARD L. LANG, industrial sales engineer in Ohio Fuel's Toledo district, succeeded Mr. Frome . . . Rheem Manufacturing Co., New York, has named C. T. MILLER assistant general sales manager. RALPH W. COOKE, Chicago sales manager, succeeded Mr. Miller as sales manager of the appliance division, and Mr. Cooke has been replaced by W. S. GOODFELLOW, assistant western regional sales manager, who moved from California . . .

After 31 years of service with Equitable Gas Co., Pittsburgh, EARL E. KEELER, assistant general superintendent of distribution, retired July 1 . . . Howard Supply Co., Los Angeles, has announced the promotion of RAE R. ELLIS, sales representative, to manager of the pipe, valve, and fitting division . . . RON SHEPHERD, A. O. Smith Corp. water heater representative in Philadelphia, has been assigned an expanded sales area including Baltimore and the states of Virginia and Delaware. Under his direction, J. S. McCOLLOUGH will operate in Maryland and Delaware and W. D. FURLONG will cover Washington, D.C. . . .

Brooklyn (N.Y.) Union Gas Co. has announced the simultaneous election of REINHOLD H. JOHNSON, former assistant comptroller, as general auditor and FRANCIS MONTELIONE, former staff assistant in accounting, as assistant comptroller . . . McDonnell & Miller Inc., Chicago, recently announced the election of JOHN W. JAMES as vice president in charge of research . . . ROBERT T. HUYCK has been appointed manager of the industrial gas burner division of Roberts-Gordon Appliance Corp., Buffalo, succeeding the late CARL O. NORDENSSON. Mr. Huyck joined the company in 1937 as Mr. Nordensson's assistant.

Estate Stove Co., Hamilton, Ohio, has appointed NED WEINMAN as market research manager. He has been associated with Estate since 1933, most recently as sales and market analyst . . . STUART W. JOHN, public utility rate consultant, has been named rate department head for Commonwealth Services Inc., New York City. He was formerly with Ebasco Services Inc., New York.

Vulcan Rubber Products Inc., Brooklyn, recently announced the appointment of three new members to its sales staff. They are LYLE GOODMAN as Detroit representative, GARVICE HILL to cover Texas and adjacent territory, and T. P. CONNELLY as Mid-Atlantic representative . . . FRANK L. KIERNAN, associated with Michigan Consolidated Gas Co., Detroit, since 1925, was recently appointed assistant secretary of the company . . .

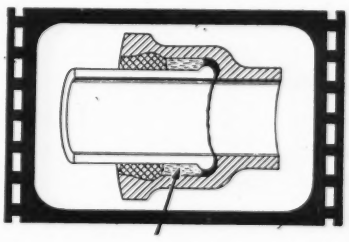
GOMER L. JENKINS, purchasing clerk for Peoples Natural Gas Co., Pittsburgh, retired last month . . . Michigan Consolidated Gas Co., Detroit, has appointed FRANK L. KIERNAN as assistant secretary. ALVAN V. BRASHEAR, assistant operations manager, recently was named to the Michigan Safety Conference.

CHANGING OVER? ..... then consider CARBOSEAL Trade-Mark ANTI-LEAK for dried-out packing.

The jute and hemp packing of bell-and-spigot joints dries out rapidly in dry manufactured or natural gas, propane or butane systems. The result is increased gas leakage, vegetation damage, hazardous conditions, and costly maintenance of dry gas mains. By introducing CARBOSEAL Anti-Leak into your mains, you can save money, reduce dust problems, and get as high as 100% reduction in leakage.

CARBOSEAL Anti-Leak reaches every joint. It swells the jute fibers as much as 44%, and keeps bell-and-spigot joints gas-tight indefinitely. It also wets down rust and dirt in the mains and reduces service calls due to pilot outages.

With CARBOSEAL Anti-Leak, you don't have to uncover every joint or keep adding oil or water vapor to your gas. Where mains are graded, CARBOSEAL Anti-Leak is poured in at high points. As much as 400 feet of level main can be treated through one opening using a hose and nozzle. The average cost to treat one mile of 3-inch equivalent main is less than $100 for the CARBOSEAL Anti-Leak required. Joints treated with CARBOSEAL Anti-Leak 17 years ago are still gas-tight today with no re-treatments necessary. Get the facts by writing for our booklet, F-4506.



You can see exactly how CARBOSEAL Anti-Leak works by writing for our 16 mm. color motion picture which will be loaned to you without charge—Address:

CARBOSEAL ANTI-LEAK

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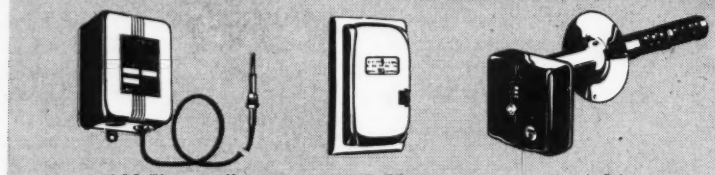
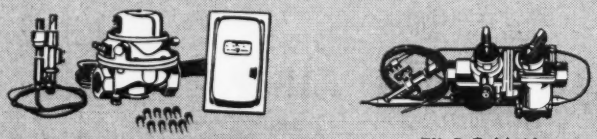
AUTOMATIC CONTROL
for product or process



A-100 Thermopilot Relay Automatic Reset

T-70 Room Thermostat

L-34 Fan and Limit Control



BX-69 Room Thermostat Package Set

TX-5 Cold Air Return Package Set

GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cleveland 15, Columbus 15, Dallas 2, Denver 4, Detroit 21, El Paso, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Milwaukee 3, Minneapolis 2, Newark 6, New Orleans, New York 17, Omaha 2, Philadelphia 23, Pittsburgh 22, Salt Lake City 4, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6, D.C.
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THE NATION'S *FASTEST-SELLING* GAS CIRCULATORS

The Peerless line of circulators is pre-eminently the Nation's first choice. For you, that means, greater volume . . . more profits . . . and better satisfied customers. Peerless' modern styling and eye appealing beauty combined with top quality and latest engineering advancements represent the ultimate in heating value.

A.G.A. approved for all gases including L.P.

★Made to Sell ★Made to Last ★Made to Satisfy

PEERLESS MANUFACTURING CORP.
LOUISVILLE 10, KY.

Obituaries

Temco Inc., Nashville, Tenn., lost two executives in a plane crash near Fort Collins, Colo., on June 30—FRANK C. DRAKE, sales manager, and P. W. CULLOM, chief engineer. Mr. Drake joined Temco in 1941 as a general accountant and moved to the sales department in 1943. He became sales manager in 1948. Mr. Collom was active in trade association work and in the development of gas heating appliances. He became chief engineer in 1948 and since then had been on the AGA approval requirements committees for gas-fired room heaters and clothes dryers.

THOMAS B. GREGORY, a pioneer in the development of the gas industry, died in Pittsburgh recently at the age of 90. Mr. Gregory helped found the Ohio Fuel Corp., which was later merged into Columbia Gas and Electric Corp., retiring as vice president and director of the company in 1944. A member of the Pennsylvania Natural Gas Men's Assn., American Gas Assn., and American Petroleum Institute, Mr. Gregory also served as president of Manufacturers Light & Heat Co., Pittsburgh, from 1921 to 1927 and as chairman of the company from 1927 until 1944.

ARTHUR DOLAN, sales manager, Hoyt Heater Co., Los Angeles, died on June 22 at the age of 46. He had been associated with the company for 15 years, rising from a field sales position. Mr. Dolan served on a number of GAMA water heater division committees and on the water heating committee of the AGA residential gas section. He was chairman of the PCGA water heater division, manufacturers section, and was a member of the group that developed the original PCGA domestic water heater sizing program.

ROSS C. CORNISH, who recently retired from the Gas Machinery Co., Cleveland, died of a heart attack on June 21. Mr. Cornish had been associated with a number of gas companies, served as chairman of the AGA technical section, and was instrumental in the construction and operation of gas plants in Panama and Colon. In 1935 he was active in the changeover to natural gas in Minneapolis.

CARL O. NORDENSSON, manager of the industrial gas burner division of Roberts-Gordon Appliance Corp., Buffalo, since 1935, died June 2. Mr. Nordensson, a graduate of the University of Stockholm, in 1918 obtained the first patent on a low pressure industrial type natural gas burner produced in this country.

GEORGE W. TESCH, 50, died recently after a lengthy illness. He had been in charge of industrial sales in northeastern Wisconsin and upper Michigan for Wisconsin Public Service Corp., Green Bay, since 1945 and had been associated with the company since graduation from the University of Wisconsin in 1923.

Lone Star Gas Co., Dallas, has announced the recent death of ELMER H. ARBUCKLE, office manager at Hamilton, Texas, a veteran of 25 years' service with the company.

ASSOCIATIONS

This Month

Japs Upset Time Table; Force Early PCGA Date

When the State Department requested all San Francisco hotel space for the Japanese peace conference, which will move in on Sept. 3, Pacific Coast Gas Assn. officials sat down to the tremendous task of changing dates and notifying the membership.

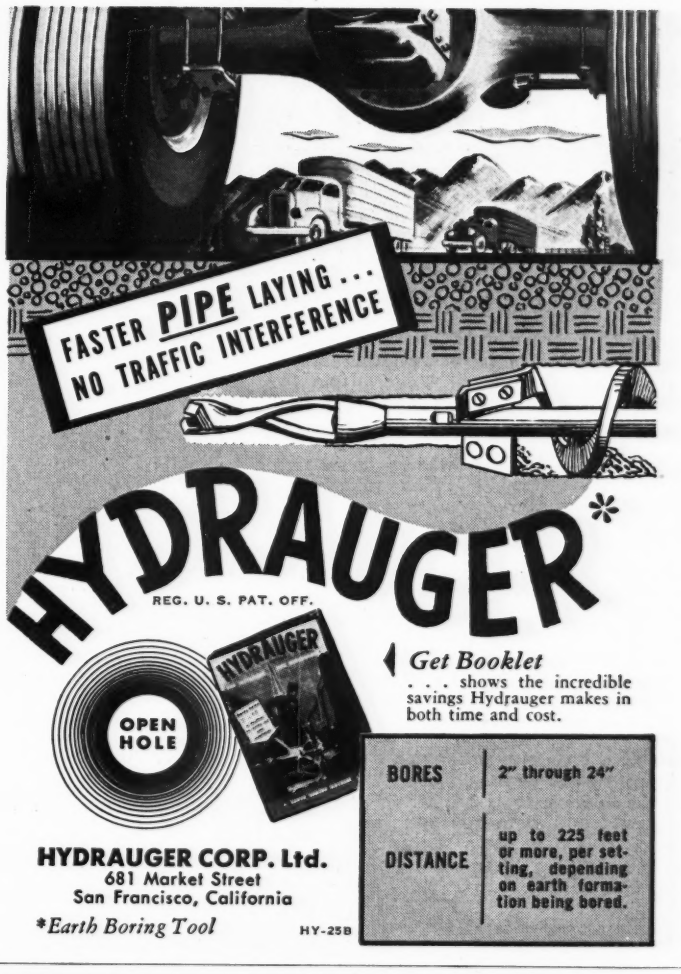
As a result, the 58th annual convention will get under way on Aug. 21, with all meetings scheduled for the Fairmont hotel as originally planned. E. G. Lawson, Pacific Public Service Co., will yield the president's gavel to W. M. Jacobs, Southern California Gas Co., who has served as 1951 vice president. Other nominees are J. S. Moulton, Pacific Gas & Electric Co., for vice president; Harry McGann, PG&E, for treasurer; W. C. Mainwaring, B. C. Electric Co., and J. D. Roberts, Mountain Fuel Supply Co., for new directors; R. T. Richards, Central Arizona Light & Power Co., for the remaining year of Mr. Moulton's term as director; and T. T. Arden, Robertshaw-Fulton Controls Co., and C. P. deJonge, San Diego Gas Electric Co., for additional two-year terms as directors.

At the annual meeting of the Manufacturers Section, T. T. Arden will be considered for general chairman and W. J. Bailey Jr., Affiliated Gas Equipment Inc., for general vice chairman. Howard Dyer, Minneapolis-Honeywell, has been nominated for chairman of the accessories division; T. R. Bridges, Williams Radiator Co., for chairman of the heating division; and Ray Polverini, Pioneer Water Heater Co., for the same post in the water heater division.

Opening the business sessions at 10 a.m. Aug. 21 will be the meeting of the Manufacturers Section, at which "Materials Controls" will be discussed by Harold Massey of GAMA. "The Role of Business in Preparations for Defense" is the topic D. A. Hulcy, Dallas, has selected for his address at the opening luncheon. Reports of section chairmen and of the general nominating committee will start off the first general session, to be followed by remarks from H. Carl Wolf, AGA, and Frederic O. Hess, GAMA.

Speakers scheduled for Aug. 22 include F. M. Banks, SoCal, on "The State of the Industry"; Allan W. Lundstrum, Ohio Fuel Gas Co., "The Utility's Responsibility for Industry Development"; and Willard F. Rockwell, Rockwell Manufacturing Co., "The Manufacturer's Responsibility for Industry Development." Featured at the afternoon session will be J. S. Moulton, "The Gas Supply in California"; John H. Murrell, DeGolyer & MacNaughton, "The Story of Natural Gas Reserves"; and James F. Bell, Portland Gas & Coke Co., "The Future of the Gas Industry in the Pacific Northwest."

"The LP-Gas Industry in the West" will be discussed by H. W. Vossler, Richfield Oil Co., at the closing session, Aug. 23, and Dr. Clark Kerr, University of California, will review "Wage and Manpower Problems." "Rate and Financing Problems of Public Utilities" is the topic chosen by W. J. Herrman, SoCal.



It's all in the shape
even in Gas Regulators
Take Maxitol Gas Regulators, for instance . . . they're different! In fact they are the only "new" regulators to appear on the market in twenty years! They don't take gas "over the hurdles"—instead they permit gas to follow the path of least resistance!
This "straight-thru-flow" of gas means less energy loss—it means a greater rated capacity per smaller unit. It means greater savings!
This "better shape" gas regulator means you can construct manifolds of greater input capacity without increasing to greater pipe sizes!
Maxitrol is new—and better! If you have pressure regulator problems investigate this finer product.
DETROIT GAS REGULATOR CO.
1742 RIVARD
Maxitrol
DETROIT 7, MICH.

A NEW ODORIMETER*

An instrument to determine whether a fuel gas when diluted to a standard degree still has enough odor to warn of its presence before reaching a dangerous concentration, or to evaluate numerically the odor level of a gas by means of psychometric measurements according to Weber's law.

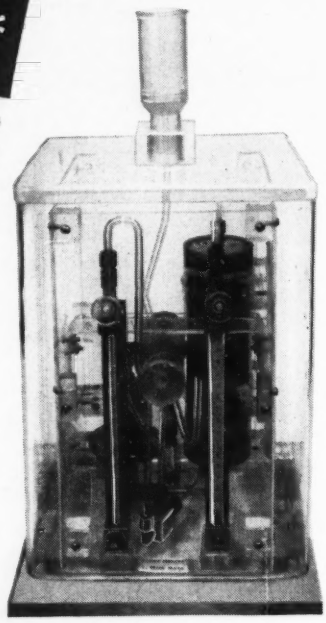
This instrument completely extracts a known proportion of odorant from the gas, diluting the odorant to any known fraction. The odor of the resultant gas may be judged as present or absent, etc.

Operated solely by a single stream of gas flowing from a main or vessel, which alone furnishes the power, whereas other odorimeters require auxiliary equipment.

The odorimeter provides for the admixture of any chosen proportions of odorized fuel gas and deodorized fuel gas drawn from a single source, and the presentation of the mixture to a funnel or nosepiece; the mixture may be smelled, and the degree of odor estimated either numerically or as perceptible or imperceptible.

The absence of moving parts, the simple design, the use of the kinetic energy as the sole source of energy, and as diluent (in lieu of air) of deodorized gas derived from the same source, permit the instrument to be readily portable and easy to use.

*PATENTS PENDING.



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Home of beautiful EMPIRE ROOM, famous dine-dance rendezvous.

The CENTRALLY Located

RICE HOTEL

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CALENDAR

AUGUST

Pacific Coast Gas Assn. Annual Convention—Fairmont hotel, San Francisco, Aug. 21-23.

SEPTEMBER

New Jersey Gas Assn. Annual Meeting—Monmouth hotel, Spring Lake, N. J., Sept. 7.

Maryland Utilities Assn. Fall Conference—Virginia Beach, Va., Sept. 7-8.

Mid-West Gas Assn. School and Conference—Iowa State College, Ames, Sept. 13-14.

Oklahoma Utilities Assn., Gas Division—Biltmore hotel, Oklahoma City, Sept. 21.

Independent Natural Gas Assn. of America Annual Meeting — Skirvin hotel, Oklahoma City, Sept. 24.

American Society of Mechanical Engineers—Hotel Radisson, Minneapolis, Sept. 25-28.

OCTOBER

Texas Mid-Continent Oil & Gas Assn. Annual Meeting—Beaumont, Texas, Oct. 8-9.

39th National Safety Congress & Exposition of the National Safety Council—Chicago, Oct. 8-12.

AGA Annual Convention — St. Louis, Oct. 15-17.

National Metal Congress and Exposition—Detroit, Oct. 15-19.

National Assn. of Corrosion Engineers, South Central Region—Corpus Christi, Texas, Oct. 18-20.

NOVEMBER

Wisconsin Utilities Assn. Technical and Sales Convention—Schroeder hotel, Milwaukee, Nov. 14-16.

American Society of Mechanical Engineers—Chalfonte - Haddon Hall, Atlantic City, Nov. 25-30.

DECEMBER

Institute of Cooking and Heating Appliance Manufacturers Semi-Annual Meeting—Cincinnati, Dec. 3-5.

MARCH 1952

National Assn. of Corrosion Engineers—Galveston, week of March 10.

New England Gas Assn. — Hotel Statler, Boston, March 27-28.

Mid-West Gas Assn. Annual Meeting—Hotel Radisson, Minneapolis, March 31-April 2.

APRIL

National Conference of Electric and Gas Utility Accountants—Hotel Commodore, New York, April 7-9.

AGA Distribution, Motor Vehicles, and Corrosion Conference — Benjamin Franklin hotel, Philadelphia, April 7-10.

Southwestern Gas Measurement Short Course — University of Oklahoma, Norman, April 8-10.

Southern Gas Assn. Annual Convention—Galveston, April 28-30.

Mid-West Regional Gas Sales Conference—Edgewater Beach hotel, Chicago, April 28-30.

MAY

AGA Commercial Gas School — Chicago, May 5-9.

AGA Natural Gas Department Spring Meeting—Biltmore hotel, Los Angeles, May 12-13.

Gas Appliance Manufacturers Assn. Annual Meeting — The Broadmoor, Colorado Springs, May 21-23.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 26-28.

JUNE

Canadian Gas Assn.—Chateau Frontenac Quebec City, Quebec, June 8-12.

E. D. Milener

James Beall

Last Month

AGA Revises Supervisory Setup in Three Sections

Supervisory positions in the natural gas, research, and publicity sections of the American Gas Assn. have been revised and streamlined.

Eugene D. Milener, coordinator of utilization research, has been named secretary to the manufactured and natural gas departments. In addition, he has assumed the administrative duties at AGA headquarters that were formerly handled by George H. Smith. Mr. Smith continues as director of the natural gas department, but he will eventually move to Washington, D.C. to manage the association's new office there.

In preparation for an expanded publicity program, James M. Beall has been appointed director of a new public information bureau, replacing the publicity bureau and the bureau of publications. He was also named secretary of the association's publicity and advertising committee. Mr. Beall's AGA career has included editorship of the *Proceedings* and the *AGA Monthly*, assistant publicity director, and, since 1949, manager of publications.

Thomas Lee Robey, secretary of the general research planning committee, has taken on added duties as coordinator of research. Assisting as research engineer will be Roy A. Siskin, formerly with the Cleveland laboratories. Press relations, and particularly financial news, will be handled by George A. McDonald, who has been appointed manager of press relations in the public information bureau. Mr. McDonald had been publicity director since 1949.

Conversion Problems Aired

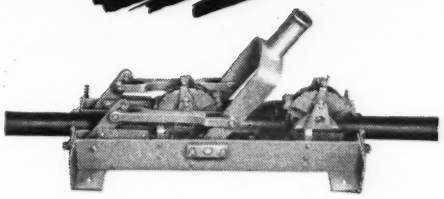
Boston's Statler hotel was the scene recently of a one-day conference on economic problems involved in a changeover from manufactured to natural gas. Sponsored by AGA's committee on economics and NEGA's company managers conference, the meeting was attended by more than 100 New England gas executives.

Four panels were held to consider load growth following introduction of natural gas, market surveys as a basis for selecting natural gas loads, load studies and their significance in planning, and economics of pricing after introduction of natural.

General chairman of the meeting was E. W. Morehouse, General Public Utilities Corp., New York.

The TROJAN pipe puller and pusher

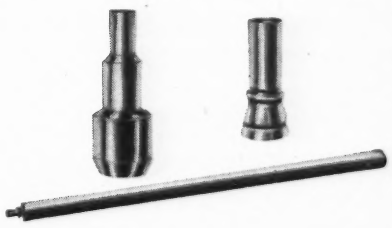
Cuts costs, Saves time!



Simplifies installation or renewing of gas service lines under pavement

You get double action and continuous operation with a Trojan Model B Pipe Puller and Pusher. It's more than twice as fast . . . doesn't require any resetting of the grip . . . and pushes or pulls up to 2" pipe without additional dogs, clamps, or wedges.
The Model B has three pushing speeds for different types of soil and can be reversed in 30 seconds. It is constructed entirely of steel and weighs 140 lbs. Each part is heavy enough to withstand the most severe treatment.

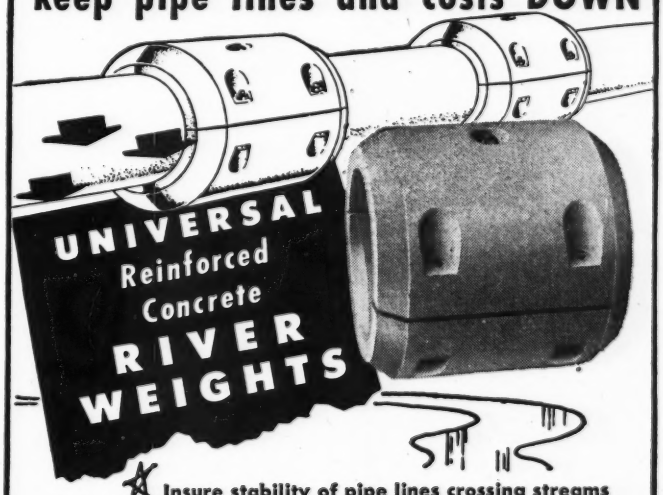
Heavy steel push pipe comes in 30 inch lengths . . . has all inside couplings, insures straighter travel, and requires a trench only 5½ feet long to operate the pusher. Joints are faced on ends to assure perfect alignment when screwed together.
Pilots and couplings are made large enough to pull covered iron pipe without destroying the covering.



Write today for full details.

The TROJAN Manufacturing Co., 1112 Race Drive
Troy, Ohio
41 Greenway, Hamden, Conn. • Box 465, Memphis, Tenn.

keep pipe lines and costs DOWN



Insure stability of pipe lines crossing streams or lakes, prevent movement with current and tendency of line to "buoy up." Rounded construction offers less resistance when snaking pipe into position.

River weights come in two sections, may be easily bolted together after encircling the pipe. Long-lasting concrete weights are more economical. Universal manufactures river weights for most sizes of pipe. Fifteen plants insure swift delivery. Write today.

UNIVERSAL Concrete Pipe Co.
GENERAL OFFICES: 297 S. HIGH ST., COLUMBUS, OHIO

Decatur, Alabama • Dothan, Alabama • Atlanta, Georgia • Kenvil, New Jersey • New York City, New York • Syracuse, New York • Port Washington, New York • Rochester, New York • Binghamton, New York Columbus, Ohio • Zanesville, Ohio • Norristown, Pennsylvania Pittsburgh, Pennsylvania • Nashville, Tennessee • New Martinsville, West Virginia • Clarksburg, West Virginia • Wheeling, West Virginia

Pardon Me!
but -
YOUR GAS LEAKS ARE SHOWING
...in several places

SHOWING RED in your profit and loss statement or on your Balance Sheet

SHOWING as HAZARDS for your claim dept.

SHOWING as STUMBLING BLOCKS for overloaded distribution and maintenance depts.

But - your leaks show up BEST to a HEATH ENGINEER who will locate and classify them at a minimum cost.

DON'T DELAY - don't waste a day! Have a

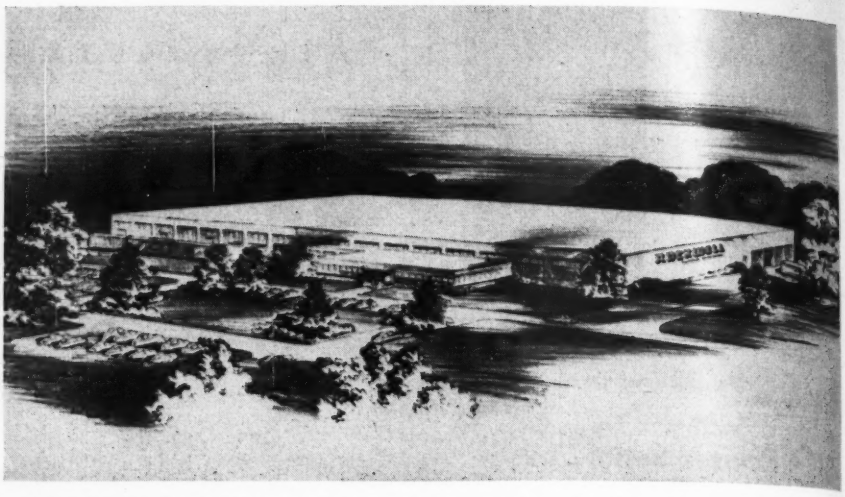
HEATH
GAS LEAK LOCATION SURVEY

Milton W. Heath

WRITE
WIRE OR PHONE

HEATH
TREE SERVICE INC.
WELLESLEY, MASS. RICHMOND, MICH.

You Can't Sell Gas That Leaked Out



CONSTRUCTION of this plant at Tupelo, Miss. was started in March by Rockwell Manufacturing Co., Pittsburgh. The one-story, 150,000-sq ft building will serve as a southern service depot for a number of the firm's products; some will be fabricated in the plant.

Mitchell Heads Nominees For 1952 AGA Offices

Heading the list of nominees to be considered for election as AGA officers and directors at the association's annual convention in October is George F. Mitchell, Peoples Gas Light & Coke Co., who has been suggested for 1952 president. Others are Charles E. Bennett, Manufacturers Light & Heat, for first vice president; Earl H. Eacker, Boston Consolidated, for second vice president; and Edward F. Barrett, Long Island Lighting, renominated for treasurer.

G. F. Mitchell

For two-year terms as directors, the following were nominated: B. C. Adams, Gas Service Co.; M. A. Abernathy, United Gas Pipe Line; L. L. Baxter, Arkansas Western Gas; Ralph L. Fletcher, Providence Gas; J. A. Fry, Detroit-Michigan Stove; R. M. Heskett, Montana-Dakota Utilities; E. G. Lawson, Pacific Public Service; J. F. Merriam, Northern Natural; Dean H. Mitchell, Northern Indiana Public Service; J. French Robinson, Consolidated Natural; Louis Ruthenburg, Servel; Earl Smith, South Jersey Gas; Paul R. Taylor, Stone & Webster Service; Thomas Weir, Union Gas Co. of Canada; and J. Theodore Wolfe, Consolidated of Baltimore.

Newsnotes

AGA recently appointed Hayes S. Walter to take over the duties handled by John J. Bourke, director of commercial gas cooking promotion, who was recalled last fall by the air force. Mr. Walter, formerly with Ard Manufacturing Co., Evansville, Ind., as manager of the commercial cooking division, will work (out of AGA's New York office) with affiliated associations in the commercial cooking field, headquarters of national chain organizations, and commercial gas sales and promotional departments of member companies.

Fred H. Bunnell, general supervisor of gas distribution for Consumers Power Co., Jackson, Mich., was elected president of the Michigan Gas Assn. at the group's annual meeting at Mackinac Island, June 25-26. Mr. Bunnell had been vice president of the association for the past year.

Industrial and commercial gasmen of the New England Gas Assn. recently held several meetings to discuss conversion problems, particularly those related to industrial customers. The industrial sales and engineering group held a round table discussion panel with manufacturers representatives answering questions. The commercial group heard a talk on conversion of heavy duty commercial cooking equipment given by Myron W. Ryder, Cambridge Gas Light Co.

Beginning in mid-June, AGA's window and store display committee sponsored a month-long Old Stove Round-Up display contest. Under Class I contestants were to enter a photograph of a window or store display used in a previous Old Stove Round-Up. Class II called for a sketch or diagram of a proposed display. Awards of $100, $50, and $25 savings bonds will be made in each classification.

At the annual meeting of the Canadian Gas Assn. held at Bigwin Inn, Ontario, Russell M. Perkins, Windsor, was elected president; Raymond Latreille, Montreal, first vice-president; and D. K. Yorath, Edmonton, second vice president. Executive members include F. R. Talin, Chatham; H. W. Durgy, St. Catharines; C. H. Lutz, Dunnville; W. R. Ward and D. H. Thorburn, Hamilton; W. H. Gallagher, Weston; and P. W. Geldard, Toronto.

J. Stanford Setchell has been appointed secretary of the operating section of the AGA. Mr. Setchell joined the association in 1936 and has been serving as acting secretary of the section since the recent retirement of A. Gordon King.

TRADE LITERATURE

ROCKWELL MANUFACTURING CO., 400 N. Lexington Ave., Pittsburgh 8, Pa.—A 30-page bulletin (No. 1083) covering aluminum and cast iron case domestic meters for measuring manufactured, natural, and LP-Gas has been issued. Capacities from 150 to 415 cu ft/hr at .60 sp gr are covered.

BLAW-KNOX DIVISION, Blaw-Knox Co., Pittsburgh, Pa.—The gas equipment department has published research bulletin No. 2353 on gas conditioning and gas equipment. The 20-page pamphlet contains some unusual illustrations, including photomicrographs, showing the effects of entrained wet and dry dusts.

MINNEAPOLIS-HONEYWELL REGULATOR CO., Brown Instruments Division, Station 40, Wayne & Windrim Aves., Philadelphia 44 — Instrumentation Data Sheet 10.5-4, "Humidities for Industrial Air Conditioning Recorded and Controlled Electronically, Rapidly, Directly," describes humidity measurement from remote locations.

VULCAN RUBBER PRODUCTS INC., Brooklyn 20, N.Y.——A new illustrated brochure details properties and designs of a wide range of synthetic coated diaphragms for all types of gas meters. A second folder describes molded diaphragms for use in regulators, governors, and controls which have a wide range of applications requiring diaphragm-actuated equipment.

MODINE MANUFACTURING CO., Racine, Wis.—Specialized heat transfer surfaces for industrial products and processes are covered in Bulletin ID-151. Its title is "Opportunities for Product and Process Improvement Through Industrial Heat Transfer Engineering."

CHEM-TECH INDUSTRIES INC., 10428 National Blvd., Los Angeles 34—A four-page brochure introduces Pene-Treat, a synthetic protective coating for use on a number of different surfaces. Several of the "surfacers" and their applications are listed.

STAUFFER MANUFACTURING CO., 2453 Merced Ave., El Monte, Calif.—This firm's 1951 catalog, titled "Stop That Leak With Pipeline Repair Products," describes its entire line. Specifications and illustrations are included for each item.

SURFACE COMBUSTION CORP., Toledo 1, Ohio—Bulletins recently issued are SC-151, "Standard Rated Furnaces for Every Tool Room," and SC-152, "Heat Treating Furnaces for the Aircraft Industry."

KEROTEST MANUFACTURING CO., 2525 Liberty Ave., Pittsburgh 22, Pa.—Bulletin No. TS-50 discusses the firm's cast steel general twin seal valve. Included are photographs of its various positions, table of dimensions, and parts list.

DOWELL INC., Dept. P, P.O. Box 536, Tulsa 3, Okla.—"Cut Maintenance Costs With Dowell Service," a new 8-page brochure, is available upon request.

For a Quick and Easy SALE:

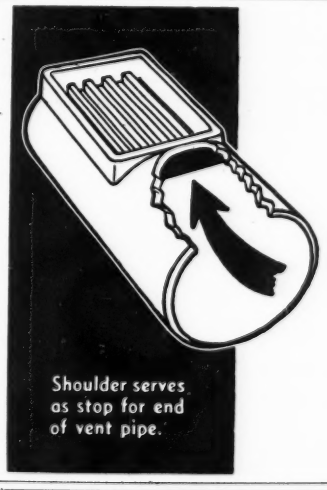
Show Her ENTERPRISE!

We have ALREADY shown her the beautiful streamlined ENTERPRISE with the HIGH-BROILER and AUTOMATIC IGNITION in her favorite national magazines. Let her see it IN YOUR STORE NOW.

For details on this profitable line of time-honored GAS Ranges, write

Phillips & Buttorff MANUFACTURING COMPANY
NASHVILLE, TENN. • ESTABLISHED 1858

Enterprise EST. 1858



Reduce Costly Service Calls

- VENT GUARD ends troubles caused by clogged house regulator vents. Simply slip VENT GUARD (grid down) over end of vent pipe and tighten Allen screw.
- 1/16" slots bar insects yet allow rapid venting. Open area is 50% greater than cross-section area of ⅜" pipe.
- Recessed grid is protected from weather and tampering.
- Die cast of non-rusting, zinc-aluminum alloy.
- Fits ⅜" iron pipe, and may be adapted to other sizes. Tell us your specific needs.
- Reasonably priced and stocked for quick delivery.

Many thousands now in use throughout the country on both intermediate and high pressure services.

WRITE FOR SAMPLE FITTING AND PRICES

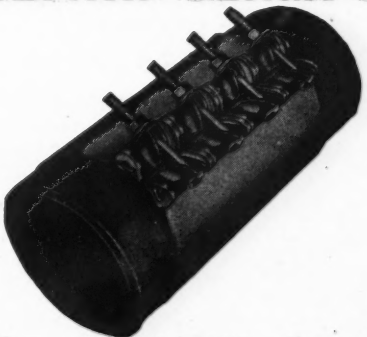
VENT GUARD CO. R. F. D. No. 1, Box 16 EAST LANSING, MICH.

STAUFFER PIPE REPAIR CLAMPS

give you

PERMANENT PIPE REPAIR!

with stainless steel bands and soft neoprene rubber gaskets.



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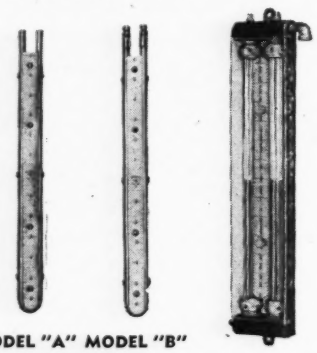
NORWALK MANOMETERS

For Water, Mercury, Oil or Glycerine



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Ideal for Serviceman's Kit

HEAVY DUTY TYPE

MADE IN ALL SIZES and TYPES

For pressure or vacuum use. Service Type has unbreakable tubing and will stand abuse. Send for bulletin 3100M for complete data and prices.

NORWALK VALVE COMPANY
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Manufacturers of
NORWALK-CONNELLY REGULATORS
Since 1878

SULFUR-FREE GAS

AT LOWEST COST

WITH IRON SPONGE

Iron Sponge is a concentrated purification material that operates with high efficiency at high or low pressures, has excellent capacity and activity, gives long service between foulings and is simply and quickly regenerated. This is why Iron Sponge has been preferred for H_2S removal for over 75 years.

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Propane Plants

When the weather gets rough, and your load shoots up—knock off those peaks with a Drake-town Propane Plant. High or low pressure — automatic or manually controlled — you'll find a Drakeotown design to meet your needs.

Peak Shaving - Augmentation
Standby - 100% Service
Large or Small

"DRAKETOWN"
Your assurance of a *good* job

SERVING UTILITY & INDUSTRY FOR OVER THIRTY YEARS

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STOPPERS | *Since 1897*

ALL KINDS OF
PIPE STOPPERS

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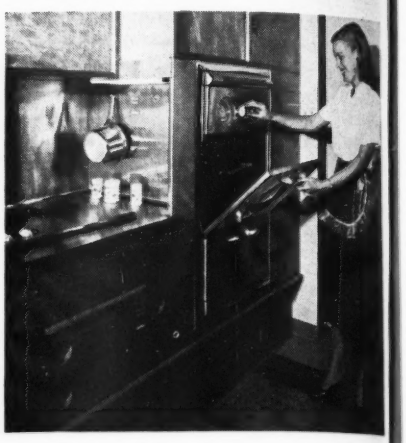
NEW PRODUCTS

Built-In Range

WESTERN STOVE CO. INC., 8536 Hayn St., Culver City, Calif.

MODEL: Western-Holly built-in range units.

DESCRIPTION: Installation is said to be no more difficult than with traditional ranges, once cabinets are roughed in, and the units may be built into existing kitchens as well as new ones. The AGA-approved

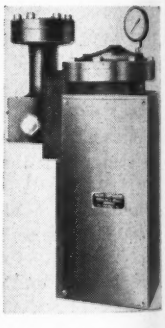


units consist of an oven-and-broiler and a 4-in-line top burner cooking surface. Oven and cook top may be placed adjacent to one another or at widely separated places.

The oven and broiler combination features a Telechron clock control, Minitmaster timer, oven door window, light, and glide-out broiler. When racks are removed, the 18-in. oven expands to 20-in. The 4-burner cooking top drops into an 18x42-in. recess in the top of a standard base cabinet.

Both units are being produced in stainless steel or white, blue, yellow, or green porcelain enamel.

Flow Signal Transmitter



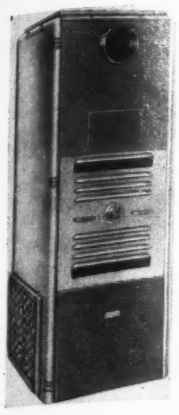
HAGAN CORP., Pittsburgh, Pa.

MODEL: High pressure flow signal transmitter.

APPLICATION: For automatic control and recording or indicating flow of gas in process systems, liquid fuel flow to burners, differential resulting from changes in liquid level in open or closed vessels, absolute pressure, etc.

DESCRIPTION: This pneumatically operated measuring unit transmits proportional signals to remote instruments or to automatic control units. Interchangeable measuring elements cover a continuous range of pressure differential from 5.5 in. w.c. to 100 psi, at static pressures up to 1500 psig. Accuracy of measurement is within 1% of full scale reading, the manufacturer states.

Furnace



MORRISON STEEL PRODUCTS INC., 601 Amherst St., Buffalo 7, N. Y.

MODEL: UF-6-G Mor-Sun furnace.

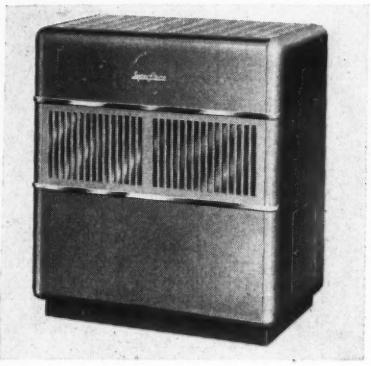
DESCRIPTION: This gas-fired unit has a 100,000 Btu/hr input rating and a Bonnet output of 80,000 Btu/hr. Mass produced of pressed steel parts and factory assembled, it is 58¾ in. high and requires floor space of 22 x 25 in. The burner is a fixed orifice, venturi tubular design, producing a semi-luminous full-floating convex flame. There are no ports to clog or to be redrilled if gas specifications are changed. A one-piece electronically welded fire box eliminates the possibility of gas leaks.

Console Heater

QUEEN STOVE WORKS INC., Albert Lea, Minn.

MODEL: Superflame Gas Saver D-45.

DESCRIPTION: This heater, with 45,000-Btu input rating, is one of five new Gas Saver models. The others range from 18,000 to 65,000 Btu input. Dimensions of the



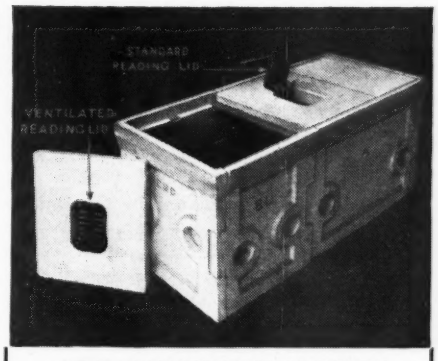
D-45 are height, 32¼ in., and width, 28⅞ in. Features of the new AGA-approved line include a double "Gas Saver," which the manufacturer says more than doubles square inches of heating surface per Btu input by slowing flame travel, reducing chimney loss, and extracting more heat from the fuel; stainless steel ribbon-type burner; and the all-in-one safety control which combines pressure regulator, pilot filter and valve, main burner valve, graduated control valve with safety catch, and 100% shutoff valve. This new control may be made completely automatic by the addition of an electric or non-electric "add-on" thermostat, optional accessories.

Combination Burner

NORMAN PRODUCTS CO., 1150 Chesapeake Ave., Columbus, Ohio.

MODEL: POC-200 Norman Twinfuel Industrial-commercial gas-oil burner.

DESCRIPTION: Listed by Underwriters



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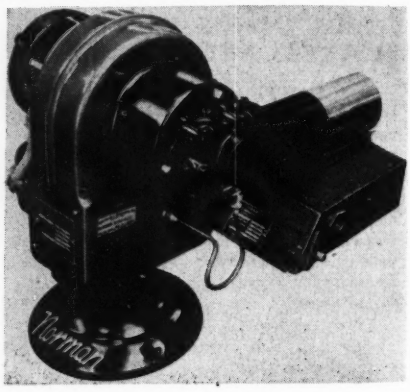

burner circuit as soon as gas pressure is established. When gas pressure drops unexpectedly, the oil burner is brought into use automatically.

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Temperature Indicator

TEMPIL CORP., 132 W. 22nd St., New York 11.

MODEL: Tempilaq.

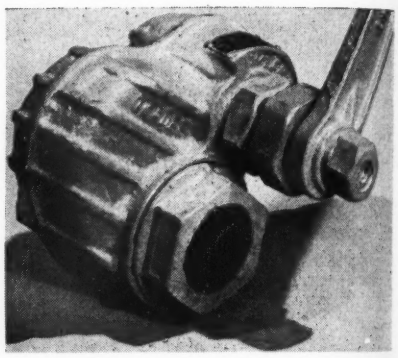
DESCRIPTION: With the addition of Tempilaq to indicate 2000°F, the product is now available in 12 or 13° steps from 113 to 400°F, and in 50° steps from 400 to 2000° F. After drying, Tempilaq will liquefy at the stated temperature.

LP-Gas Valve

OKADEE CO., 332 S. Michigan Ave., Chicago.

MODEL: Flanged and screw type cast steel valves.

APPLICATION: For use in standby LP-Gas plants.



DESCRIPTION: Available in sizes from ½- to 6-in., these full opening valves have hard metal-to-metal seats and discs. They have been approved by Underwriters Laboratories Inc., by various state LP-Gas commissions, and by a number of major oil companies.

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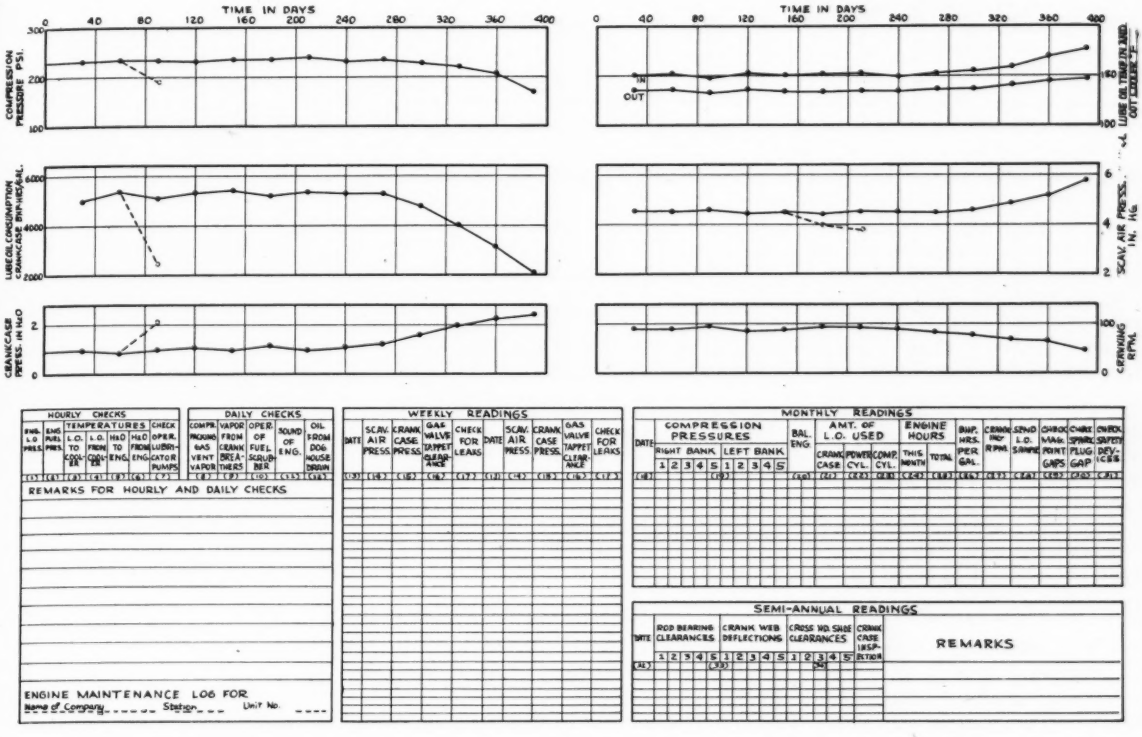


FIG. 1. Recommended log of events from which indicators, or pointers, are taken to use in determining engine condition and, therefore, exact time when overhaul or adjustment is necessary. Figs. 2 through 11 show various segments, in sharper detail.

PREVENTIVE MAINTENANCE

A Practical Program for Compressor Engines

Many, many times in the past we as engine builders have been asked to prepare maintenance programs for operators of our equipment. In many cases operators were running engines without any planned maintenance program. Although the engine builder realized the necessity and importance of helping these operators, nothing could be done because no one plan of maintenance has been flexible enough to fit all installations.

Nevertheless, engine production has increased so rapidly and the demand for trained personnel has become so acute that the impossible problem of recommending a workable and practical maintenance program had to be solved. This article is Cooper-Bessemer's attempt to achieve that end. The following three points will be used in dealing with this problem:

1. Why maintenance is more important today.
2. Maintenance programs and their advantages.
3. A practical preventive maintenance program for all installations.

By J. H. CALDWELL
Cooper-Bessemer Corp.
Mount Vernon, N. Y.

Importance of Maintenance

The successful operation of engines always has and always will depend upon four things:

1. The design must be right.
2. Correct materials must be used in order to realize success from a good design.
3. The assembly, both in the shop and in the field, must be completed without error.
4. The engine must be maintained properly.

The first three are out of the control of the operators; nevertheless, no matter how well they have been accomplished, successful operation of an engine cannot be carried on without good maintenance.

The strides in the past few years made toward increasing horsepower output have been amazing. Lengthy experimental tests and actual field experience are definite proof that design has kept up with this increased horsepower trend. Likewise, here of late, the material made in the engine builders' plants as well as in those of the vendors, such as bearings, piston rings, etc., has accepted the challenge toward this trend, and it is evident that the engine of today is quite capable of giving as good and even better service than the slower speed type engines of the past.

It is true that maintenance has always been an important factor in the operation of an engine; nevertheless, a significant fact that has to be realized is that any malfunctioning of key parts in the engine of today, such as piston rings, bearings, etc., tends to lead the engine to destruction much faster than with the older type engines. Therefore, it is no wonder that the service departments of engine builders are of the

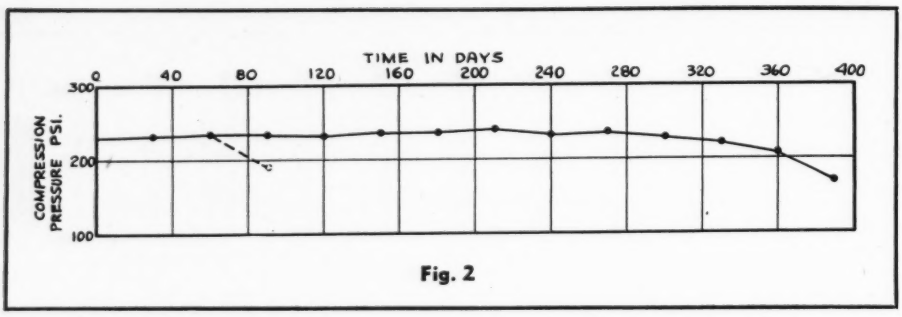


Fig. 2

opinion that of the four "musts" mentioned above, maintenance is the most important. This means that the operator of today will have to be more vigilant and will have to keep ahead of his engines. Engine builders will have to devote more time to the customer's particular application so that better cooperation will result.

Other Maintenance Programs

1. Running the engine to complete destruction before any maintenance or adjustments are made. All will agree that this is absurd, but it is an actual fact that engines are receiving such treatment today. We mention it only for that reason, and because we will use it as a point in selling the idea of preventive maintenance later in this article.

2. Progressive maintenance. This program can best be explained by the following example. Say, for instance, an 8-cylinder engine is involved, and it has been determined by past experience that the engine should be overhauled every 8000 hours. The operator starts out by first stocking a complete subassembly unit—that is, cylinder head assembled, piston, rod with bearings, etc. After the engine has operated 1000 hours, No. 1 cylinder is completely dismantled and the spare unit is taken from the stockroom and installed.

The engine is then started and, while it is running, the unit that was withdrawn is cleaned and thoroughly inspected for cracks or any signs of failure. At the end of the next 1000 hours, the No. 2 cylinder is completely dismantled and the unit that was cleaned is installed. The assembly from cylinder No. 2 is then cleaned and inspected and set aside until the next thousand hours. This program is carried on until at the end of 8000 hours all units have been overhauled.

The advantage of this type of maintenance is that you do realize the maximum of availability of the engine, but the disadvantages far overshadow the advantage. In the first place, it is very costly because you do not get the maximum life out of the parts. For instance, if the piston rings are sluggish or if the tension is not sufficient or comparable to a new ring, the rings are thrown away. Incidentally, rings removed from the piston should be destroyed and new ones installed.

Another disadvantage of this type of maintenance is that there is always one unit that is not mated in. It is a known fact that parts do not reach their maximum efficiency until they have been run together for a number of hours, so in the case of piston rings, one cylinder would always be using an excessive amount of lubricating oil. However, the really serious drawback with this type of maintenance is that it does not guard against serious casualties caused by premature failure of some vital part.

3. Periodic inspection maintenance. In this type, the assemblies constituting the engine are torn down, inspected, and cleaned after they have been run a specified number of hours. Although it has its advantages and is used extensively by some competent operators, it has many drawbacks. The first of these is needless disassembly of the vital parts of the engine. Removal and replacement of parts still in excellent condition, no matter how carefully done, frequently induces trouble. Perhaps this is caused by simply disturbing parts which have found their optimum running fit or finish.

Furthermore, in tearing down assemblies on the engine, dirt is introduced. This is true even in the cleanest of installations. Likewise, during operation of any engine, carbon and dirt are constantly collecting in places where it is not doing any harm. However, in tearing into the assembly, this dirt and carbon will likely be moved to a place where it can do damage.

In setting up the inspection periods, the specified hours between them has been determined by an average established by an engine builder's test or past performance. However, some small part deep down in the assembly might fail due to material weakness or previous faulty assembly. Failure of this small part leads to premature casualty for the entire assembly. So in this type of maintenance the operator is not free from disastrous casualties because, regardless of the amount of experience both the engine builder and operator have had with the engine, no one can predict how long a particular assembly is going to last. This type of maintenance is also very costly because it takes a large amount of materials such as gaskets and, as in the case of progressive maintenance, the parts do not reach their maximum life. The amount of labor involved in carrying out this type of maintenance also increases the cost.

The big disadvantage of the above-mentioned programs is their lack of flexibility. The engine builder cannot adopt any one as standard and recommend it to all customers; therefore, the engine builder, of all people, is left without any plan of maintenance.

Preventive Maintenance

The ideal program would have everything that those previously mentioned lack in addition to their advantages.

In discussing the other forms of maintenance, two basic facts are brought out.

1. Certain vital parts last longer and operate better if not frequently taken apart.
2. Operation until complete destruction is foolish and costly.

The above two facts represent the extremities of the situation. It is definitely poor policy to be constantly tearing the engine down for inspection; on the other hand, we cannot go to complete destruction before exercising some form of maintenance and adjustment. Inasmuch as maintenance is the most important factor in successful operation, an answer has to be found.

Thousands of hours of operation have proved to us that 99% of all failures are preceded by certain signs or conditions. This basic fact gives us a clue to the answer—practical preventive maintenance. This is a program whereby a series of very simple tests and observations is used to determine the condition of vital parts before they are taken apart or fail. Forced interruptions of service inherent in the other types of maintenance are reduced to a minimum. Unnecessary dismantling of the engine is avoided. Above all, it is very economical because the maximum life of all parts is realized.

It also has advantages over the other forms of maintenance in that it lessens the chances of major casualties. All it requires are a few simple instruments which already are available in almost any installation.

The key to the program is a daily log on important events. From that log, indicators, or pointers, are taken to be used to determine the condition of the engine and, therefore, the exact time when the engine should be overhauled or adjusted. The pointers are many, and can be explained by referring to *Fig. 1*, which is a recommended log of events. It will be noted that this log is divided

into two parts. The lower half is for recording values of tests, such as compression pressures, clearances, etc. Also included are several hourly and daily checks which are not recorded, but should be observed. The various tests are included in periods at which they should be taken. However, the period at which each is taken is only a recommendation, and the operator might want to change the frequency of the test to suit operating conditions and available personnel. Possibly operating experience might indicate a necessary change. (*Figs. 2* through *11* show the various segments of the log shown in *Fig. 1)*.

Like all log sheets, it shows the figures, but trends and signs of distress are hidden. Therefore the key to this program is the top half of the log, where a series of curves gives the picture at a glance. The horizontal part is in time, such as days. The vertical part is for values of the tests.

In the upper left hand curve *(Fig. 2)* labeled "compression pressure," the readings have been taken every 30 days, and if the piston rings remain in good condition, this curve will be flat until the engine begins to approach the time for overhaul, at which time the curve will start to fall off. This gives the operator an idea of ring condition. On the other hand, if conditions were not normal and the engine was headed for premature failure after say, only 90 days operation, as noted by a decided compression pressure drop indicated by the dotted line, the operator would know that either the rings were beginning to wear or stick, scavenging valves were not functioning, or a liner was beginning to score. Any change in the curve will indicate that immediate attention is required.

This one indicator or pointer is not the only one which will reveal the above conditions of distress, however, so before any action is taken, a quick study of the other curves will either confirm or deny the above conditions.

Compression pressure readings used in making up this curve can be taken at about 75% load while the engine is on the line. The individual cylinders can be cut out by either shutting the gas off or breaking ignition and by means of an indicator, or a reading can be taken while the engine is off the line and at cranking or idling speed, whichever is convenient. But the important thing to remember in this test and the ones to be mentioned later is that we are looking for a comparison of the present with that of the previous reading, so all tests should be conducted under identical conditions. Compression pressures should be taken soon after the engine is taken off the line so that it will be warm.

The next curve *(Fig. 3)* records lube oil consumption, which is a good indicator of blowby or ring condition. The curve shown here is theoretical because consumption varies with load, but the trend of such a curve will be as shown. It is true that, as long as both oil and compression rings are sealing, this curve will be flat like the compression pressure curve, but when they begin to blow by, the lube oil consumption will fall off (hp - hrs per gal.) and at the same time the compression pressures will decrease. Therefore this drop-off of the two curves indicates to the operator that the engine will soon be in need of a ring job. However, suppose something happened to the engine prematurely and a sudden decrease in brake horsepower hours per gallon was noted. Since the sudden change took place at the same time as the compression pressures dropped (note dotted line) it is evident the rings on one or more pistons are starting to blow by.

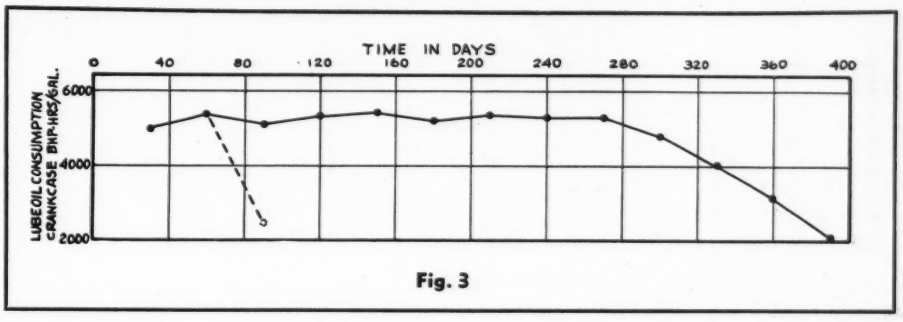


Fig. 3

Of course the above trends are not the only indicators of blowby. It is true that, everything being normal, pressure in the crankcase will remain constant. That being the case, it would be wise to plot a curve for that reading, which has been done as shown in *Fig. 4*. This curve will show the same trends as explained for the compression and lube oil consumption curves. The gradual change in the three curves after many hours of operation confirms the fact that the rings are approaching maximum life. Sudden changes as indicated by the dotted lines are red lights to the operator and if they are heeded serious damage to the engine will be eliminated.

The curves shown on *Figs. 2, 3,* and *4* are indicators of ring and cylinder condition. However, they are not the only vital parts of an engine, so additional indicators have to be used to determine condition of other parts. For instance, the lube-oil-in-and-out cooler curves in *Fig. 5* are good indications of lube oil cooler condition on both the water and oil sides. Note the gradual spread of the two curves after a long period of operation.

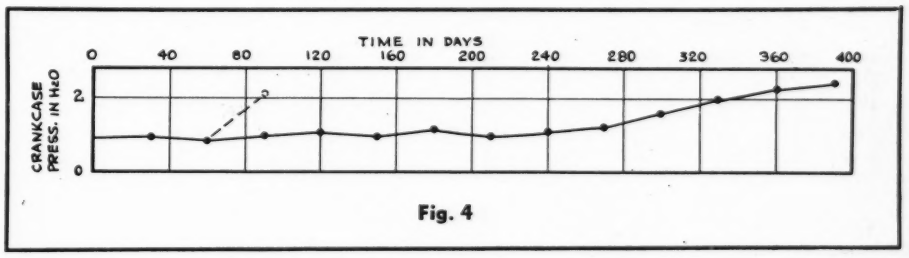


Fig. 4

Fig. 6, showing scavenging air pressure, is one of the most important indicators for two-cycle engines. Note the sudden rise toward the end. This is an indication that the cylinder ports are clogging. The experienced operator well realizes that if this condition is allowed to remain, disaster is near. However,

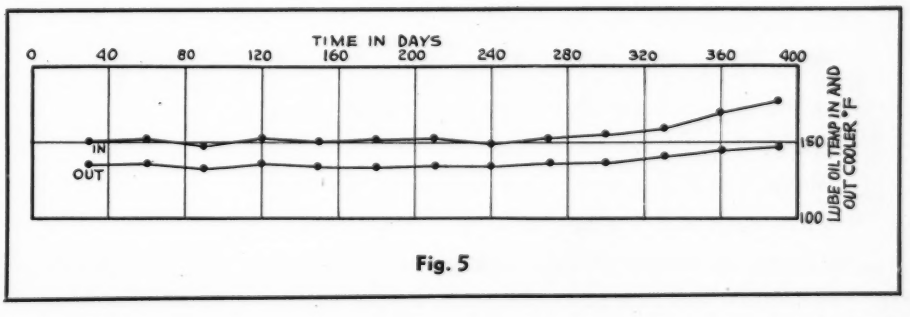
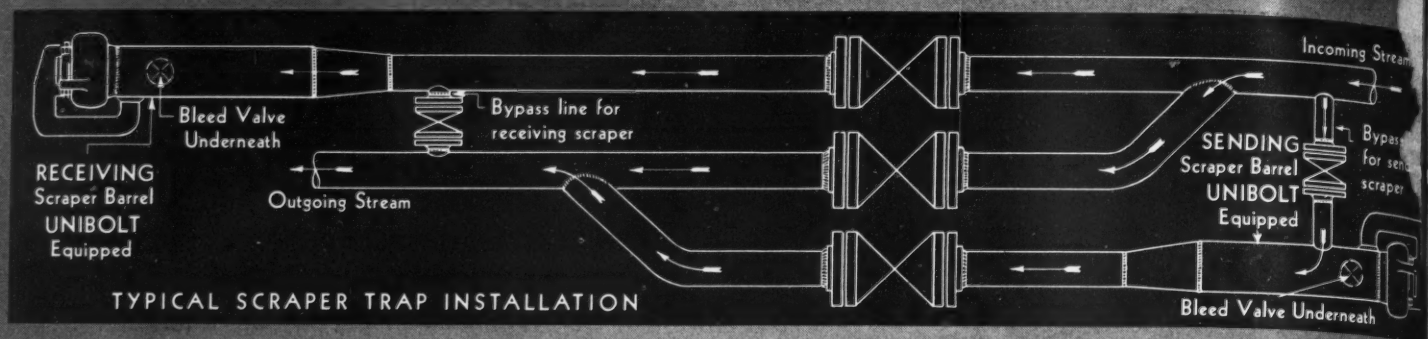


Fig. 5



TYPICAL SCRAPER TRAP INSTALLATION

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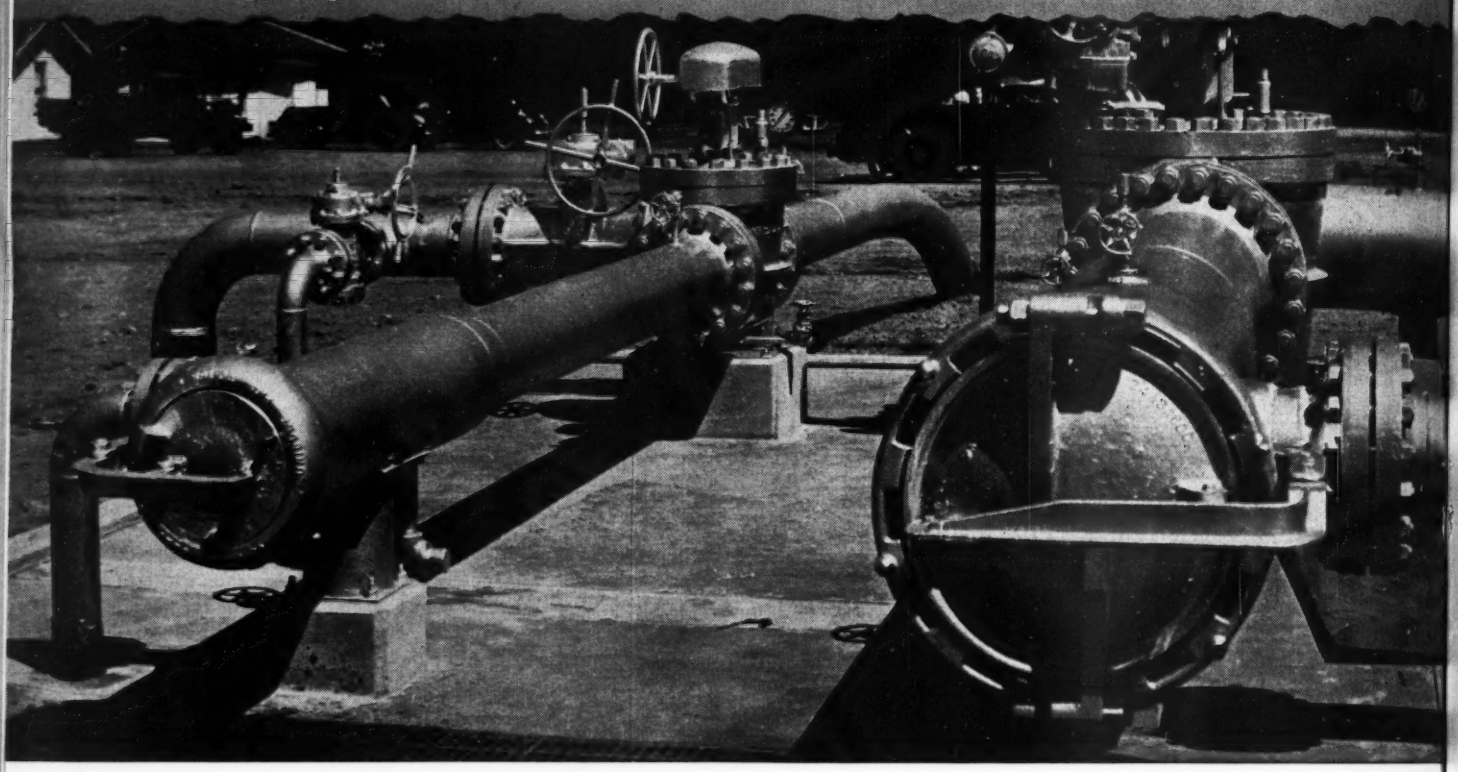

The oversize barrel does the trick. Note in the above sketch of a typical scraper trap installation how an oversize barrel on both the sending and receiving ends of the line provides ample clearance for the pig (which has the same o. d. as the pipe in which it is run). No sidebooms, tractors, rams and strongarm men required. Line pressure does the heavy work.

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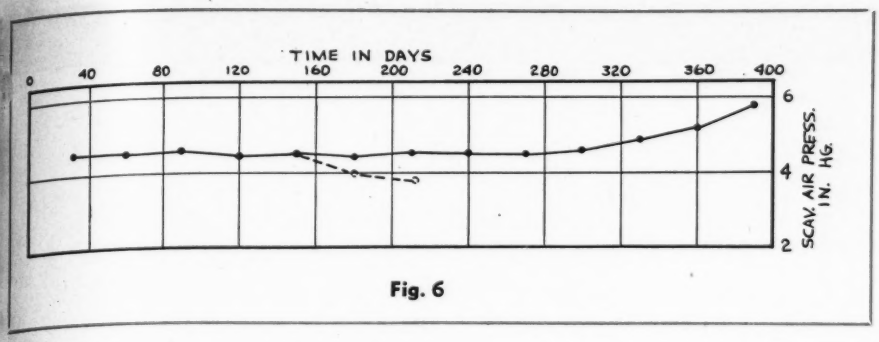


Fig. 6

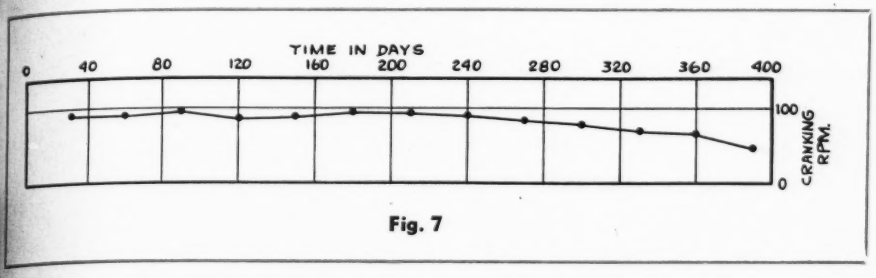


Fig. 7

suppose that after 150 days the scavenging air pressure starts to drop. This is an indication of valve failures or clogging of the air cleaner.

Cranking rpm at the engine has been plotted in *Fig. 7*. This test should be taken each time with the air tanks charged to the same pressure and when the engine is warm. This curve indicates the condition of several parts before failure actually occurs. If air starting valves are beginning to act sluggish, the cranking rpm will be less, which means the air starting system needs attention. It might be a simple thing like dirt in one of the valves or moisture in the system; nevertheless, the indicator has told the operator of this condition. Too often an engine is allowed to reach that condition, and when it is badly needed, it won't start.

A drop in rpm also indicates possible misalignment in the engine. Lacquer deposits on pistons or crossheads will also cause a decrease in cranking speed.

In carrying out the above inspection and using the pointers, it will be noted that no major assemblies have as yet been dismantled; nevertheless, by now we have a very good idea of the condition of the engine. This knowledge has been received without any forced interruptions and dismantling of the engine which experience has shown does decrease the life of parts; also, the possibility of faulty reassembly and getting dirt into the engine has been eliminated. Likewise, we have not used any parts up to this time but still we are ahead of the engine and receiving maximum life from the parts.

In regard to other indicators listed in the lower half of the log *(Figs. 8, 9, 10,* and *11)*, many are self-explanatory and several already have been dealt with, so for sake of brevity only the more important ones will be explained.

The column in which each indicator is included is numbered. Those numbers will be referred to in explaining the log. Columns 1 through 12 *(Fig. 8)* are for hourly and daily checks, but actual readings are not recorded. It is the opinion of the writer that if an operator can be taught to think instead of having excessive paper work forced on him, he will be more valuable. Nevertheless these observations are important, and any change or trends should be noted in the space specified for remarks. Lube oil temperatures to and from cooler (Columns 3 and 4) should be recorded each month so that the curve can be plotted.

Column 8 is to remind the operator to check vapors coming from the vent which is connected to the space between each compressor and the crosshead guide housing (dog house). When compressor packing begins to leak, the vapors will increase and the cause should be investigated before the rod is scored.

Column 9, checking of vapors from crankcase breathers, is a simple way of detecting piston ring blowby.

Column 11, "Sound of Engine," is an indicator that has significance and will eliminate casualties if its importance is stressed to all personnel from the superintendent down to the oiler. Each day someone should spend at least ten minutes around the engine to get the feel or normal beat of the engine noises. This person should stand by each cylinder and actually try to follow the pistons up and down in the cylinder. A tight piston or piston pin, a main or connecting rod bearing knock can be detected if the normal sound has previously been determined. A few minutes should be spent listening to the blower, crossheads, auxiliary drive, lube oil pump, etc. Once a person has the feel of his engine, he can readily pick out defects by paying this little daily visit to it.

Column 12, "Oil from Dog House Drain," is an indication of diaphragm packing condition. Any change in the amount should be investigated.

Columns 14 and 15 *(Fig. 9)*, "Scavenging Air and Crankcase Pressures," are included as weekly readings. The actual values should be recorded each week. The date should be written in Column 13 under which there are 26 spaces, but since this log is made to cover an entire year, the readings for the last half will be put into the 26 spaces under 13′, 14′, and 15′.

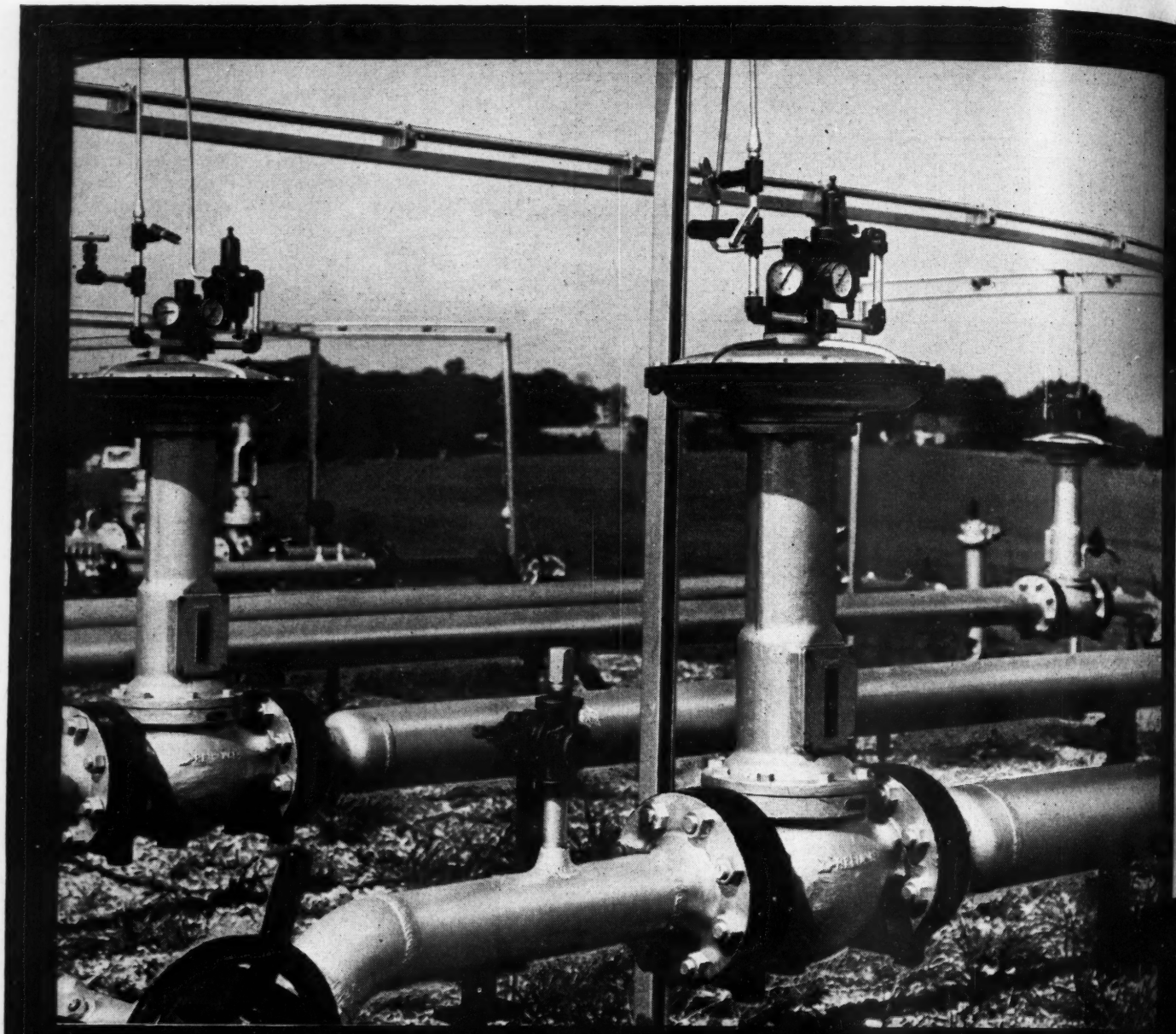
Column 16, "Gas Valve Tappet Clearance," is merely for check marks; that is, each week these clearances should be measured, and if they do not agree with the specified value, they should be reset. The check mark each week will show this has been done. If the clearances steadily increase each week, this would indicate push rod crosshead bushing wear, cam scuffing, or wear in any or all parts between the fuel cam and gas valve tappet.

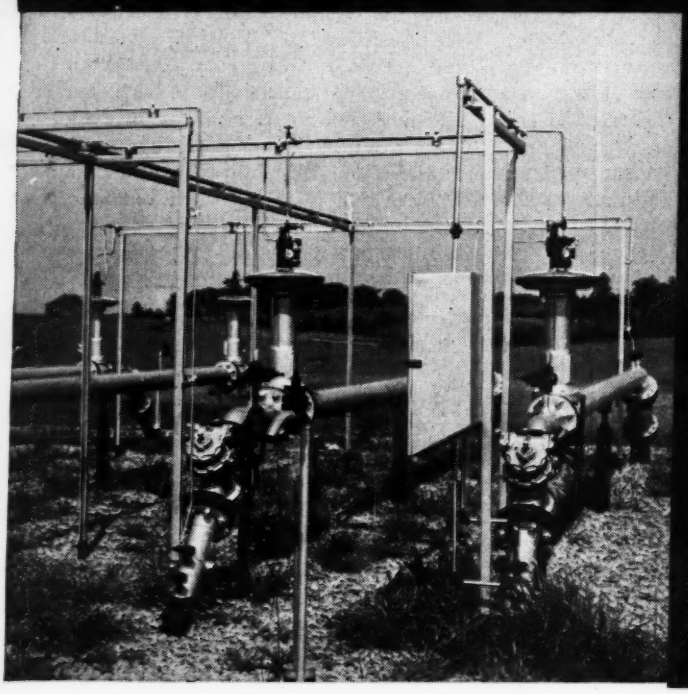
Columns 18 through 31 *(Fig. 10)* are specified as "Monthly Readings" and except for Columns 20 and 28 to 31, the actual values should be recorded 12 times each year.

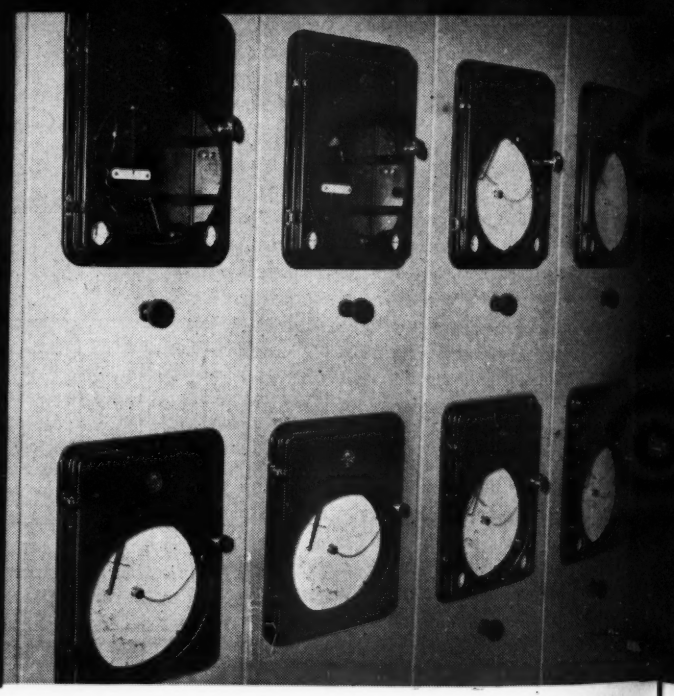
Column 20, "Engine Balance," brings up the interesting subject of the exhaust pyrometer. It is a useful instrument. It is a very easy means of detecting a faulty spark plug, and in some cases it

HOURLY CHECKS							DAILY CHECKS				
		TEMPERATURES									
ENG. L.O PRES.	ENG. FUEL PRES.	L.O. TO COOLER	L.O. FRON COOLER	H2O TO ENG.	H2O FROM ENG.	CHECK OPER. LUBRICATOR PUMPS	COMPR. PACKING GAS VENT VAPOR	VAPOR FROM CRANK BREATHERS	OPER. OF FUEL SCRUBBER	SOUND OF ENG.	OIL FROM DOG HOUSE DRAIN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
REMARKS FOR HOURLY AND DAILY CHECKS											

Fig. 8







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WEEKLY READINGS									
DATE	SCAV. AIR PRESS.	CRANK CASE PRESS.	GAS VALVE TAPPET CLEAR-ANCE	CHECK FOR LEAKS	DATE	SCAV. AIR PRESS.	CRANK CASE PRESS.	GAS VALVE TAPPET CLEAR-ANCE	CHECK FOR LEAKS
(13)	(14)	(15)	(16)	(17)	(13)	(14)	(15)	(16)	(17)

Fig. 9

is to a certain extent a measure of load. Nevertheless, we strongly recommend that the pyrometer not be used as a means of balancing an engine. This statement will, and has, resulted in quite a bit of controversy. Many operators use it today for this purpose, but experience has shown us this is wrong.

Consider, for instance, a two-cycle engine, in which the exhaust temperature, as measured by a pyrometer, has been steadily increasing on a certain cylinder. To the person who uses the pyrometer as a means of balancing, this would indicate that that cylinder is carrying more than its share of the load and it would seem logical to decrease the amount of fuel to that cylinder. However, assume that the ports were clogging without the operator realizing it, which resulted in a restriction of air. Inasmuch as the fuel has been burning with an insufficient amount of air, the temperature as measured at the exhaust will be higher, but actually the load carried by that cylinder is less. Moreover, when the operator cut down the amount of fuel to that cylinder, the amount of load carried by it was decreased again. As the temperature begins to rise because of the clogged ports, the operator keeps cutting down the amount of fuel to this cylinder to a point where it carries very little load. This decrease in power carried by the cylinder that has been adjusted throws the load onto the adjacent cylinders and keeps doing so until the other cylinders are carrying so much of the load that they actually work toward destruction.

We know very well from experience that many cylinders which were in excellent condition were actually ruined by this method of operation. Therefore, we strongly recommend that the pyrometer not be used as a means of balancing. If an operator notices the exhaust temperature in any particular cylinder is too high, he should take a peak pressure and compression pressure reading. They will give him a better idea of why the condition exists.

Another way to balance the two-cycle gas engine is to fit a long extension of about 12 in. on the end of the governor arm, and place a quadrant behind it. Divide this quadrant off into equal divisions, and then with a three-quarter load on the engine, cut out a cylinder and note the amount that the governor arm drops. This will give an indication of the amount of power that the cylinder has been taking. Then cut out another cylinder and note the amount that the governor arm has dropped, treat the remaining cylinders likewise and, if the engine is in perfect balance as each cylinder is cut out, the pointer will drop the same amount each time. If it's not in balance the gas should be adjusted at each cylinder so that the pointer will drop the same amount.

Columns 32 through 35 *(Fig. 11)* are "Semi-annual Readings." The practice of determining rod bearing clearances by use of leads is not recommended because the bearing has to be dismantled, which is against the policy of preventive maintenance. The dial indicator method is preferred. Also the method of placing one end of a web gauge on the rod and the other end at some convenient spot in the crankcase and barring the rod up and down to get a reading on clearance is satisfactory. Some will argue that these methods do not give a true reading of clearance, but even if that were true, it would not make any difference because it is merely a change in reading that is significant and will tell the operator the bearing is in distress.

"Web deflections" on all throws are good indicators of main bearing condition and will also reveal misalignment caused by cracked frame or foundation.

"Crankcase Inspection," Column 35, is very important. All oil lines, nuts, and bolts should be checked for tightness. The backs of all crank doors should be carefully checked because if a bushing or bearing has failed, metal particles will be thrown against the door. The bottom of the oil sump should be felt for foreign material. Also a portion of the liner and piston can be checked for scoring. The rods should be inspected at both ends for discoloration due to heat.

The appearance of the log *(Fig. 1)* and the amount of detail used here in the attempt to sell preventive maintenance might give one the impression that it is too complicated for practical use. However, the readings and checks are actually simple and can be used to train all personnel in regard to how an engine functions. The program will also keep supervisors in the main offices well informed on conditions of the engines and will eliminate the time-consuming bother of making lengthy reports.

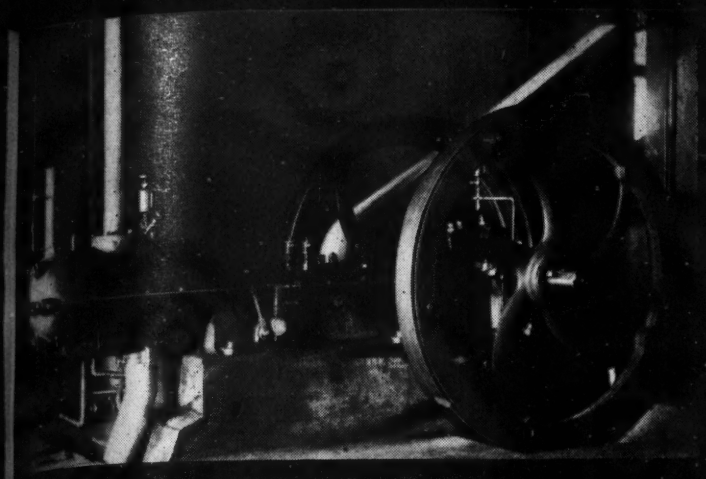
A log could be made out for each engine at the plant and at the end of each month the logs could be sent to the main office for transfer to master logs. After the information has been transferred, the logs could be sent back to the plant before the time comes for the next weekly reading.

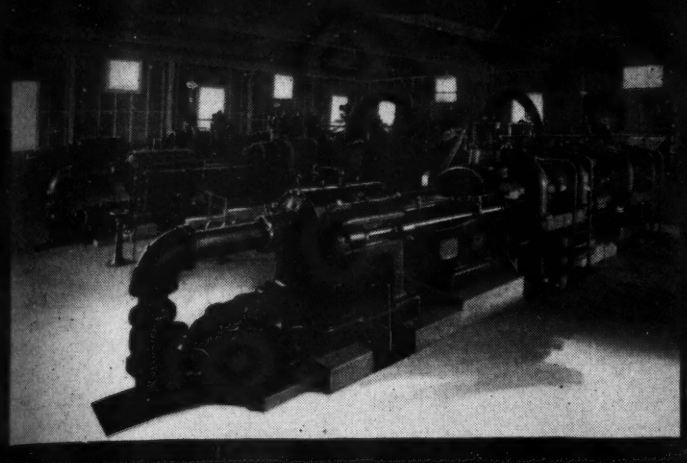
MONTHLY READINGS																								
DATE	COMPRESSION PRESSURES										BAL. ENG.	AMT. OF L.O. USED			ENGINE HOURS		BHP. HRS. PER GAL.	CRANK-ING RPM.	SEND L.O. SAMPLE	CHECK MAG. POINT GAPS	CHECK SPARK PLUG GAP	CHECK SAFETY DEV-ICES
	RIGHT BANK					LEFT BANK						CRANK CASE	POWER CYL.	COMP. CYL.	THIS MONTH	TOTAL						
	1	2	3	4	5	1	2	3	4	5												
(18)					(19)						(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)

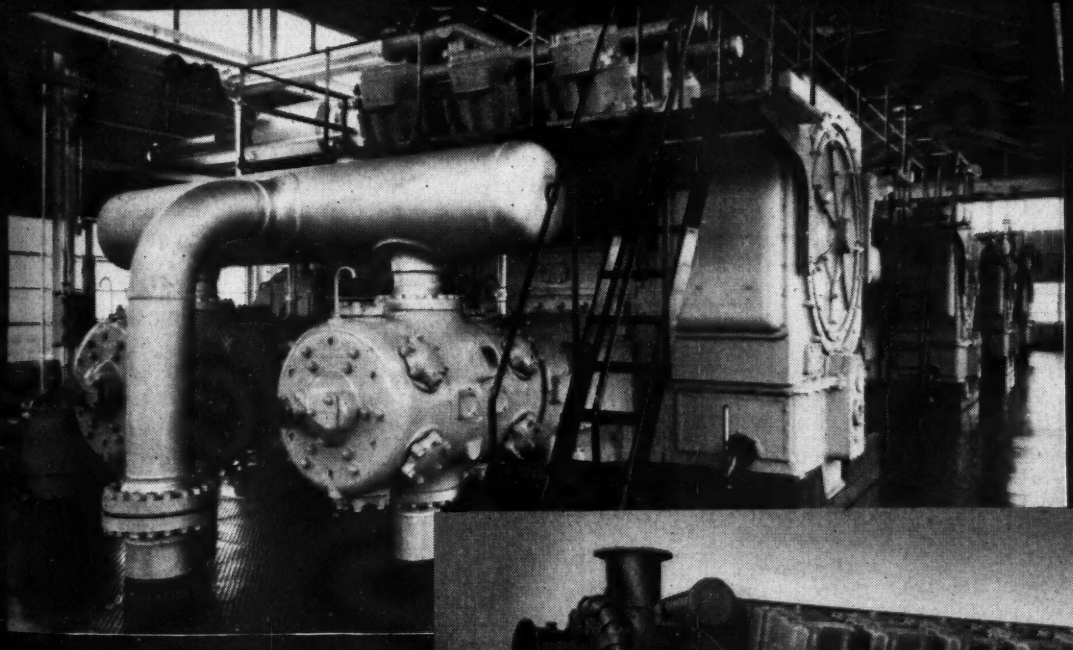
Fig. 10

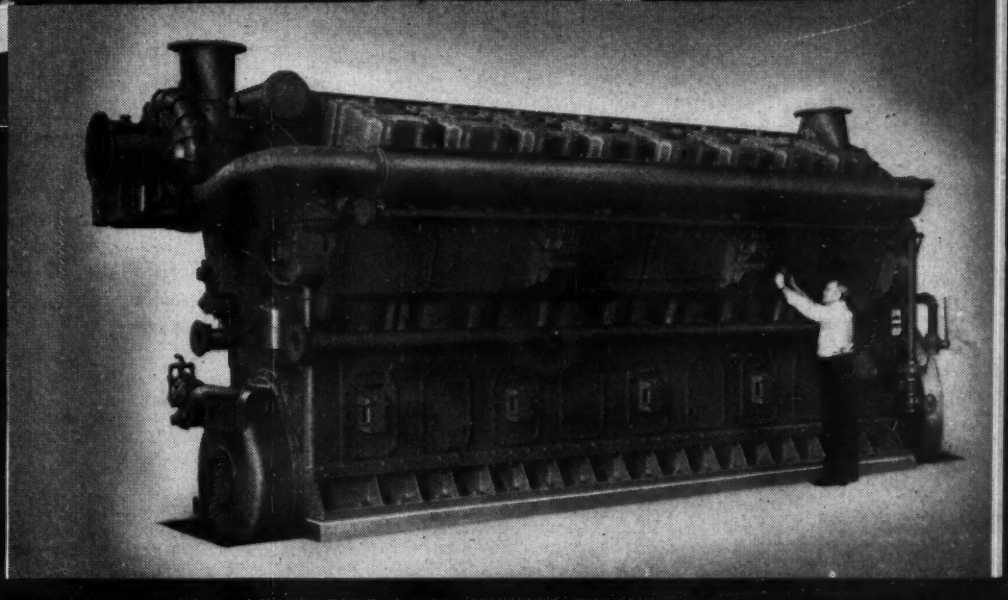
SEMI-ANNUAL READINGS																
DATE	ROD BEARING CLEARANCES					CRANK WEB DEFLECTIONS					CROSS HD. SHOE CLEARANCES					CRANK CASE INSP-ECTION	REMARKS
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		
(32)					(33)								(34)				

Fig. 11









Q. How Can We Buy the Right Amount of Gas —at the Right Time—at the Right Price?

A. Let's Produce It Ourselves!

Says R. H. HARGROVE

President
Texas Eastern
Transmission
Corp.

THE market demand for gas in the Appalachian and Eastern Seaboard area, spurred on by the favorable price of gas and its other competitive advantages—cleanliness, convenience, and an enviable record of service dependability—has been growing in snowball fashion since the end of the war. Despite the tremendous post-war growth we have experienced, however, we believe we have as yet little more than touched the surface.

Indeed I consider the major limiting factor with respect to market development is not the lack of opportunity to make sales but the exercise of managerial discretion on our part and on the part of our distributing customers. Many of our customers, for instance, have had to request regulatory restrictions on the number of house-heating applications they are allowed to accept. Even with these restrictions, they have sometimes found that the attachment of individual space heaters or other equipment not requiring applications has created unknown additional strains upon their supply. To add fuel to the fire, new defense-born industrial requirements which cannot be ignored are being placed upon the distributors, increasing their supply problems.

This situation indicates clearly to us that the direction of our future opportunity as well as our obligation is to secure additional gas supplies in the Southwest, secure the required governmental authority to expand, and then build to bring the supplies into our present markets. None of those tasks will be easy, I am sure, but of the three the actual job of building will probably be the least bothersome — providing of course that the materials are available and that investors are willing to entrust funds to our use.

Of one thing I am sure—if we can buy the gas and accomplish the necessary expansion to get it to the markets we can sell it.

A type of expansion corollary to that outlined is also very much in the picture for natural gas lines over the next few years: it is simply expansion of our search for gas to buy. If we are to secure the reserves of gas necessary as a basis for further service to our present customers, we are going to have to go out and look for them in an active, aggressive fashion. Natural gas in the Southwest is getting harder to buy every day.

Purchasing Problem

Now I do not mean that there is not enough gas to serve our present commitments, because we have demonstrated time and again to the Federal Power Commission that there is. Nor do I mean that there is not enough additional gas already discovered and proved to support additional long-distance, long-term sales propositions. There is enough, but the problem is buying enough of it in large enough reserves properly located and at a price low enough to prevent substantial increases in gas prices in our sales areas. And the problem—buying the right amount at the right place at the right price—is quite a stickler today.

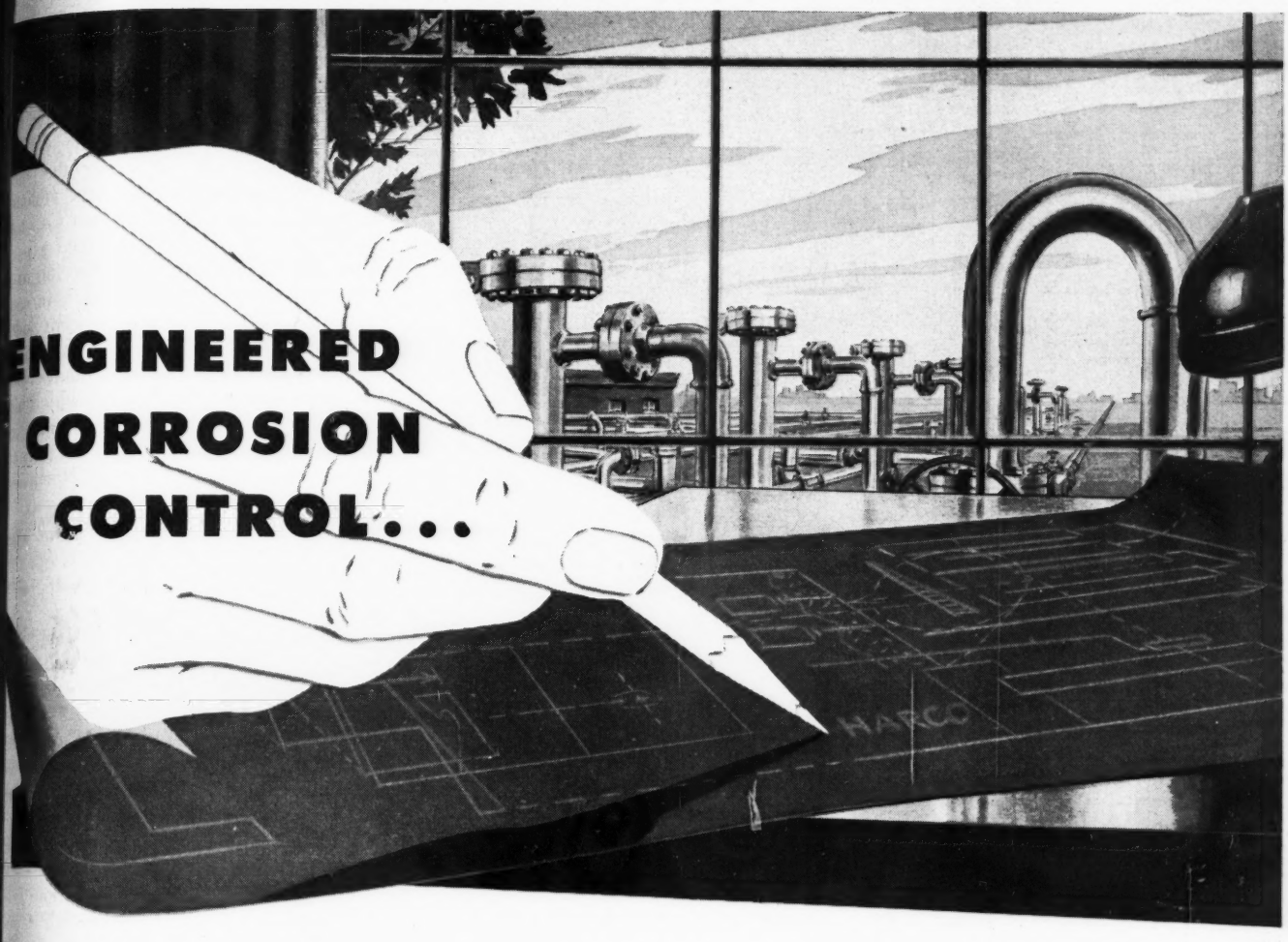
For one thing, a very large percentage of the substantial uncommitted reserves in our gas purchase area is held by large oil companies who do not have to sell the gas and who for one reason or another are reluctant to sell it to interstate pipeline companies. They may want to use it in repressuring in connection with their oil production, or they may be afraid of potential governmental regulation, or they may simply wish to hold in the hope of being able to command a higher price at a later date. Whatever the reason, however, the fact is that a good bit of the gas that we know is there is not now for sale to interstate lines such as ours.

Another facet of the problem is the fact that many of the reserves are located in small fields in somewhat isolated sections. To reach them would often mean costly extensions of our lines to secure small amounts of gas, which would make the overall cost of the gas considerably higher than we now pay. Of course if we could line up three or four small reserves so that we could pick them all up with one line, or if we could buy the gas at a sufficient discount because of its distance from our lines, then it would become economical.

After studying the problem in some detail, I have concluded that three means of securing additional gas are available to the industry.

1. Raise the purchase rates to entice reluctant owners to sell. Some lines are doing this and have already filed increased sales rates to compensate for the higher cost of gas.
2. Extend supply lines in a gigantic sort of gathering system to pick up numerous small reserves. This would call for additional capital expenditures and result in additional operating costs which would probably ultimately result in higher sales prices.
3. Get into the exploration field whole-

From an address presented before the Eastern Pennsylvania Group, Investment Bankers Assn. of America, April 13 in Philadelphia.



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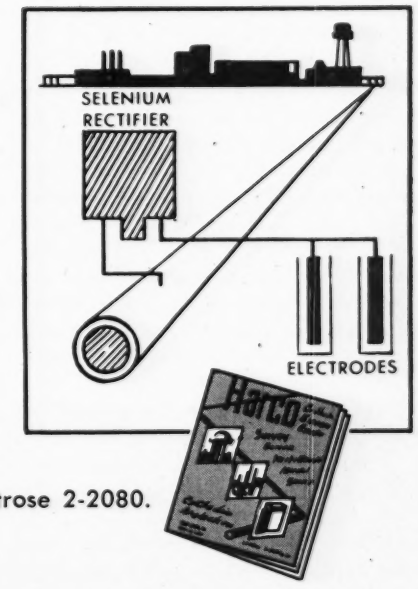

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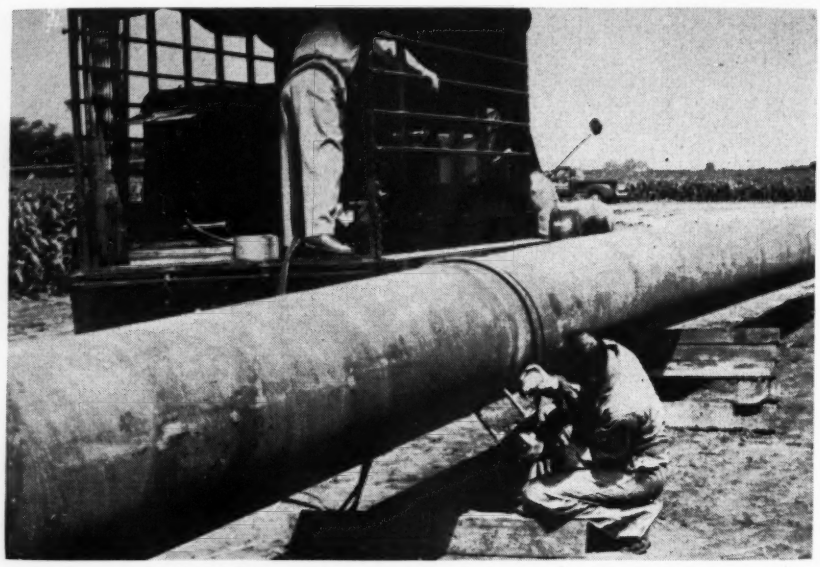


A new method of inspecting pipeline welds in the field allows coverage of every foot of every weld, according to Magnaflux Corp., Chicago, the manufacturer. Even on large diameter pipe, all circumferential welds on as much as a mile of line per day may be examined.

"Magnetic particle inspection" makes use of the fact that weld defects will attract and hold finely divided ferro-magnetic particles (which have been applied evenly to the pipe) in a pattern on the weld surface. This powder pattern builds up as the weld is locally magnetized with high amperage currents to indicate the exact location, extent, and type of defect.

Both internal and external defects are revealed. They may be chipped out, rewelded, and reinspected without cutouts. Visual inspection may be made simultaneously with Magnaflux inspection, the manufacturer says.

This method, although recently improved, has been employed on refinery and pressure piping, storage tank, and pressure vessel welds for many years.

heartedly to find its own supplies of gas. This would require additional capital also but would be much more productive of adequate returns if normal exploratory success were had.

The third alternative of course amounts to nothing more than industry integration to assure the supply of source materials, and this is the one in which most of the long lines are the most interested. Historically, most natural gas discoveries have been made by large oil companies incidental to the search for oil. When a wildcat well is drilled in unknown acreage, obviously no one can predict whether it will be productive of oil or gas, if either.

Exploration Required

Since only a few old-line gas companies such as United Gas and Lone Star Gas are engaged in extensive drilling operations in the Southwest, most of the exploration and development is carried on by the large oil companies and they acquire their proportionately large share of the discoveries of both oil and gas. Our experience in trying to buy gas from such companies for interstate movement has led us to the conclusion that it is not enough for our purposes merely to have gas discovered; we must discover it ourselves if we are to control its disposition and wind up with it as a commodity to sell.

With this in mind, many of the transmission companies have formed production subsidiaries or have acquired companies already owning production. Some may engage in exploratory activities directly. By whatever route they enter the wildcatting field, however, it is obvious that the activity will require additional new money. Probably a greater proportion of equity money will be called for by such activities than transmission lines usually require. Certainly so long as the activity is in the exploration rather than the production area, that will be the case.

A final area of activity calling for additional funds for the industry will be the development of underground storage reservoirs on and as part of long distance transmission systems. Compared to the overall cost of the systems, such capital requirements will not be too substantial, but some (such as Oakford storage, the joint project of my company and New York State Natural Gas Corp.) will involve expenditures approaching $20 million. A unique feature of the financing of storage reservoirs will be an "inventory" type loan on a short, seasonal basis, to cover the cost of gas placed in storage in the summer, prior to its withdrawal and sale in the winter.

Texas Eastern, now that it has secured the right to enter the New England market through its affiliate, Algonquin Gas Transmission Co., has no further plans for territorial expansion. As I say that, a recollection of a paper hanger's similar remark in connection with the Czechoslovakian Sudetenland comes to me, and I wonder whether you will take my remark with the same grain of salt with which history says we should have taken his. Perhaps a look at the map, and the remembrance that only the Pacific Northwest is open territory, will reassure you.

We, as a company, have the same area of opportunity and obligation open to us that is ahead of the industry as a whole. Our market area is precisely the focal point of the increasing, skyrocketing demand for more gas about which we spoke earlier. Our sales forecasts for the Appalachians, Philadelphia, heavily populated New Jersey, and finally New England all indicate to us that as a company we will have to look to the reinforcement and expansion of our supply lines even as I suggested the whole industry would.

We have a slight edge already in this respect, I think. For one thing, our new 30-in. line, running from Mississippi to the Oakford storage area near Pittsburgh, is presently planned for a capacity of 400 MMcf daily. By adding compressor stations and compressors—but without laying any additional pipe—we can increase that capacity to 550 MMcf daily. The cost of that increase of more than one-third will be only slightly more than one-sixteenth of the cost of the line as presently planned. In other words, the additional 150 MMcf of capacity which can be made available will cost us only half as much on a unit basis as the first 400 milion.

Production Subsidiary

In line with our comments about the necessity for finding our own gas, our company has already formed a production subsidiary, which has been moderately active from funds advanced by the transmission company. The subsidiary owns some properties proved to be capable of gas production in presently unknown quantities, and some properties which it intends to explore.

We expect to steadily increase the activity of our production subsidiary and, in addition, we are this month seeking stockholder authority to permit the parent company to engage in oil and gas exploratory activities, should this become desirable for tax purposes or other reasons.

Affords weight and protection

Heavy Coating Performs Dual Function For Bayou Pipelines

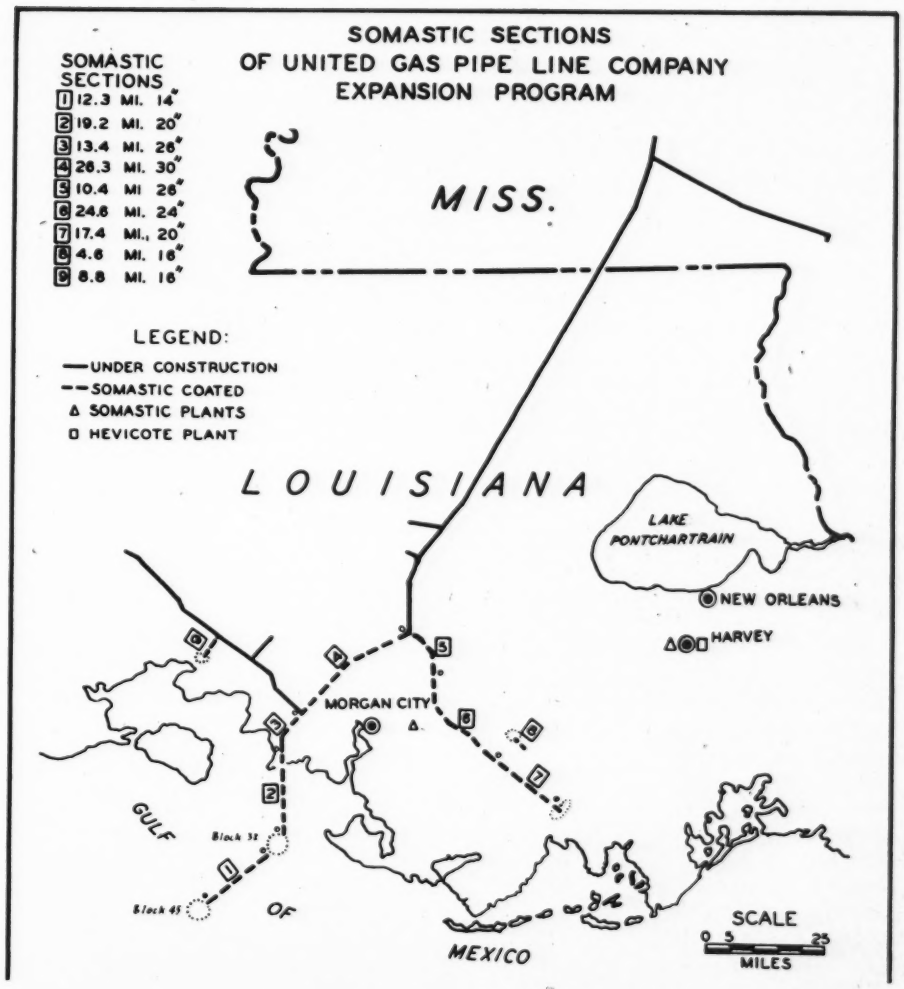
MANY homes and industries in the Gulf South and in other sections of the country will soon be provided with additional sources of natural gas fuel as the result of the current $116,500,000 expansion program of United Gas Pipe Line Co., Shreveport. The enterprise of this concern, combined with construction skills of pipeliners on the job, and an important corrosion-prevention material known as Somastic, will as a part of this program shortly make available for use extensive newly discovered reserves of natural gas in the Gulf Coast area of Louisiana.

Exclusive

The problem of getting natural gas produced in this area to market goes far beyond the usual difficulties faced in normal pipeline operations. United and the firms it engaged to build this line also have been troubled by such complications as the lack of stable ground in some areas for moving heavy construction equipment along the route picked for the pipeline, and the high corrosion rate that goes with laying a steel line through swampy ground and into the waters of the Gulf of Mexico.

In all its multifold phases, the task of "putting to bed" these vital miles of new pipeline is challenging the ingenuity, the perseverance and the engineering "know-how" of United Gas and its associates.

One important aspect of this gigantic undertaking is the application of Somastic coating to approximately 150 miles of United's pipeline. This pipe, varying in diameter from 14 to 30 in.,



MAP of United Gas Pipe Line Co. expansion shows sections in watery areas where the special coating is being applied (dotted lines). Photo of stretch of 30-in. pipe shows dark bands, which are field molds that have not been whitewashed.

is destined for those watery areas where United wanted a lifetime guarantee against corrosion, the insidious process of nature that is a pipeline owner's worst enemy.

H. C. Price Co., which holds the patent rights for Somastic coating in the 37 states east of the Rocky mountains, was engaged for this major coating project. Machinery was moved from one of Price's permanent Somastic plants at Harvey, La., to a location on Bayou Boeuf, nine miles east of Morgan City, La.

At Bayou Boeuf an endless stream of barges unloads its valuable cargo of pipe fabricated at A. O. Smith's plants in Milwaukee and Houston. Based on the schedule of the laying contractors, the different-sized pipe is processed through the Somastic plant before taking another barge ride to the remote right-of-way. The Somastic plant at Morgan City can average from 150 joints of 30-in. pipe to 300 joints of 14-in. pipe daily to stay well ahead of the laying contractor.

During its stopover at Bayou Boeuf, the pipe undergoes a radical transformation. Each joint grows thicker, heavier, and changes in color from a rusty brown to a gleaming white.

Preparation of the pipe begins with a thorough "primping," effected by a steel grit blasting machine that removes all rust and scale and leaves a smooth coat of primer on the pipe. The 40-ft length of pipe is then coupled to its predecessor and laid on dollies affixed to a permanent track for its journey through the Somastic plant.

Somastic is a mixture of 63% sand, 24% lime, 12% asphalt, and 1% asbestos. It leaves the mixing vat heated to a temperature of more than 400° and is forced through a nozzle and applied to the pipe by rotating blades.

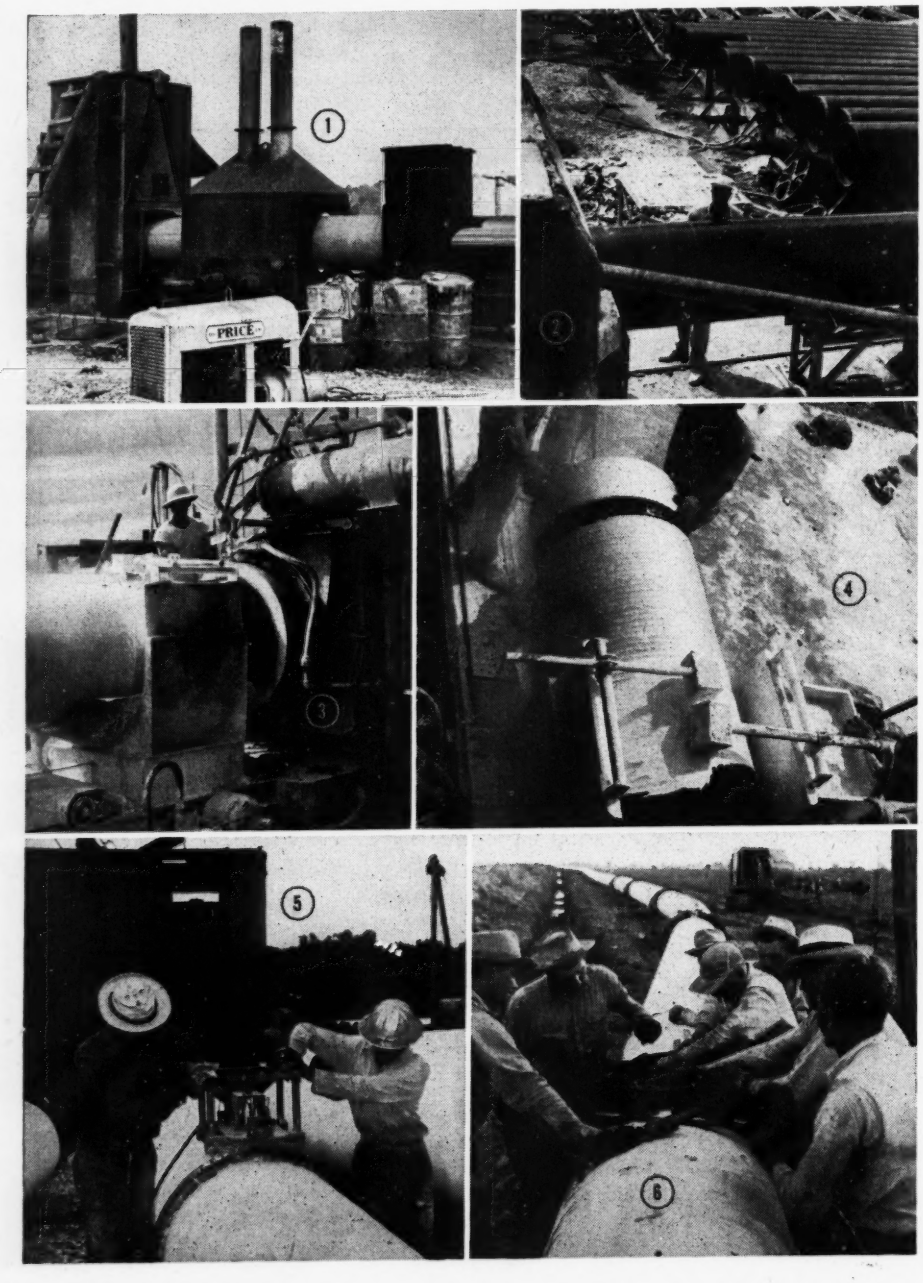
The thickness of the Somastic coating is determined by the diameter of the pipe, ranging from ½ in. for 14-in. diameter pipe to ⅝ in. for 30-in. diameter pipe. This seamless coating is given a bath of whitewash as it leaves the Somastic plant and is then laid out to cool before stockpiling or removal to the right-of-way.

In order to facilitate welding in the field, approximately 9 in. on each end of every joint is left bare. After the welding is completed, the exposed pipe is covered by a Somastic field joint applied by either a hydraulic or hand mold. This field joint overlaps the coating applied at the plant and leaves an unbroken covering.

As Somastic hardens quickly, the coated pipe will withstand practically the same treatment as a bare joint. Yet because of its flexibility, the Somastic-coated joint can be bent without causing a break or rupture. As a safeguard against holidays, the pipe is "jeeped" both at the plant and in the field prior to lowering-in.

One of the features of Somastic that particularly appealed to United Gas representatives is the weight factor it adds to the pipe. In the swampland and for off-shore lines, where negative buoyancy is a big problem, the 135 lbs that Somastic weighs per cubic foot is of great importance. For 30-in. diameter pipe the coating will increase the weight of a 40-ft joint by a full ton. Elimination of over-the-trench coating and wrapping also reduces the amount of equipment needed by the laying contractor.

Robert P. White, gulf division manager for H. C. Price Co., heads the Somastic operation at Morgan City. He is assisted by Nelson VerSoy, plant superintendent, and Vernon Jones, S. D. Pugh, and Burl Witherspoon, foreman.



SEQUENCE IN THE COATING APPLICATION. A seemingly endless tube of steel passes through the grit blasting machine (1) and emerges with a gloss of primer, ready for coating. Workmen jockey a section into position (2) for its ride through the coating machine, from which it is seen emerging (3). Whitewash sprays over the pipe (4) while workmen in background remove one of the couplers which tied the section to the one which preceded it through the plant. When the coupling is removed, 9 in. of pipe is bared, facilitating welding in the field. A holiday detector (5) then tests the coating. When the line is all tied together alongside the ditch, the bare ends of each section are covered with a field mold, which workmen are shown fitting into place (6).

THERE'S A

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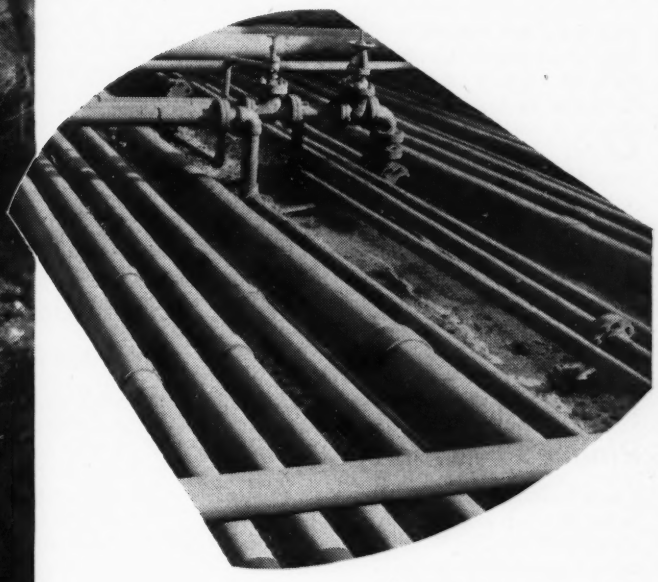
FOR EVERY OIL AND GAS HANDLING NEED



ELECTRIC RESISTANCE WELDED LINE PIPE—offers the construction and operating advantages of uniform size, roundness, diameter, and wall thickness . . . uniform high yield strength . . . uniformly straight long lengths . . . ease of bending and welding . . . freedom from scale . . . inside and out inspection. The more than 59,000 miles placed in service over the past twenty years—in transmission, distributing, collecting and products lines—prove its dependability.

CONTINUOUS WELD STEEL PIPE—made under Republic's improved continuous weld process is uniformly strong, ductile, clean, and scale-free. It is uniform in wall thickness, diameter, and concentricity . . . is easy to bend, thread and close-coil . . . easy to weld by all modern methods. It comes in economical uniform long lengths, and in extra long lengths.

LARGE DIAMETER ELECTRIC FUSION WELDED LINE PIPE—high pressure line pipe in sizes 24-, 26-, and 30-inch OD. Electric fusion welded inside and out, and hydraulically expanded to uniform size, straightness and circumference. Hydraulic expansion also increases yield strength for safe handling of high pressures. Always-constant circumference and uniform wall thickness help joints line-up accurately and quickly, speed field welding.

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PIPELINE NEWS

New Firm Seeks Illinois Storage Plan Approval

Early last month, Natural Gas Storage Co. of Illinois, a newly organized affiliate of Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co., asked the Illinois Commerce Commission for authority to develop an underground natural gas storage project 15 miles southwest of Kankakee. The company acted under a new Illinois law which gives natural gas firms right of eminent domain in the construction of underground storage projects.

Two lines now serving the Chicago area cannot deliver enough gas in winter and, during the warm months, demand falls to 25% of capacity. A Peoples Gas Light & Coke Co. spokesman said that even if approval is obtained, many northern Illinois families on waiting lists cannot be served until 1953. Engineers estimate that storage should begin in 1953 for use during the 1953-54 winter.

The Kankakee project, estimated to cost $25 to $30 million, would enable the new firm to store more than 90 billion cu ft during the summer.

Canadian Gas Importation Planned by Montana Power

Gas from fields in the Pakowki Lake area in southeastern Alberta will be imported by Montana Power Co., Butte, if its recent application for permission to build necessary facilities is approved by FPC. The gas would be produced and transmitted in Canada by two newly formed Montana Power subsidiaries.

Proposed construction includes 18 miles of 16-in. line from the gas fields to the Montana state line and about 52 miles of 16-in. from there to a connection with Montana Power's system near Cut Bank, Mont. The 18-mile line would be owned and operated by one of the new subsidiaries.

Montana Power says it will have to curtail industrial loads unless a new gas supply is obtained. Its principal industrial customer is Anaconda Copper Mining Co.

Latest reserve estimate for the Pendant d'Oreille, Manyberries, Smith Coulee, and Black Butte fields is 488.5 billion cu ft of gas in place, 434.2 billion recoverable, and 406 billion not marketable.

Iowa-Illinois Asks Line

Iowa-Illinois Gas & Electric Co., Davenport, Iowa, wants to build a 41-mile, 10-in. line from Natural Gas Pipeline Co. of America's system in Washington county to Cedar Rapids, according to a recent application to the FPC.

The $1-million project would provide capacity to serve increased loads and to protect service to the Iowa City and Cedar Rapids areas. Firm daily requirements for the Iowa City district are 5.4 MMcf; for Cedar Rapids, 15.6 MMcf. They are expected to jump to 15 MMcf and 45 MMcf, respectively, within the next 10 years.

Northern Natural Granted Temporary FPC Approval

Northern Natural Gas Co., Omaha, has received temporary FPC authorization to construct facilities which will increase its system capacity by 50 MMcf per day, to a total of 650 MMcf. The action was taken, according to the commission, to help the company to meet emergency 1951-52 winter peaks.

Hearing on the original application will begin Sept. 17. Whether Northern has adequate gas to meet future requirements will be one of the important considerations.

The 50-MMcf increase is part of a larger program which would bring daily capacity of the system north of Kansas up to 825 million. Facilities authorized by the temporary certificate include 79.5 miles of line and 27,200 hp in compressor additions.

South Bend Pool Ready For Use in October

New York State Natural Gas Corp., Pittsburgh, expects to have about 8200 MMcf stored in its South Bend pool in Pennsylvania by October. Of this amount, 4200 million will be withdrawn for use by Peoples Natural Gas Co. and East Ohio Gas Co., New York State affiliates.

Work is currently under way on reconditioning 51 active wells and redrilling 28 abandoned ones in the area, and Fish Engineering Co. is building a 12,000-hp compressor station. Contemplated storage inventory by March 1952 is 5 billion cu ft, and the ultimate goal of 13 billion will probably be reached in October 1952. Delivery capacity will be about 264 MMcf daily.

As part of the same project, which was approved on June 1 by FPC, New York State is building a 77-mile, 20-in. line from the storage area to its Petersburg measuring station and 17 miles of field lines.

Indiana Gas & Water Initial Decision Upheld

A presiding examiner's decision finding Indiana Gas & Water Co. Inc., Indianapolis, subject to FPC regulation has been affirmed by the commission, with certain modifications.

A provision in the order directs the company to comply with requirements of the Natural Gas Act by applying for FPC authorization to continue operation of facilities subject to jurisdiction, and states that a certificate issued to the company will apply only to those facilities which are subject to such jurisdiction.

On May 11, Examiner Samuel W. Jensch filed the initial decision, stating that Indiana Gas, by the operation of various pipeline facilities in Indiana, is engaged in the transportation of natural gas in interstate commerce for ultimate public consumption.

Hydrocarbon Plant to Tap TGT Line in Kentucky

Mathieson Hydrocarbon Chemical Corp., a company recently organized by Mathieson Chemical Corp., Baltimore, and Tennessee Gas Transmission Co., Houston, will produce chemicals from hydrocarbons extracted from natural gas from the TGT line. To tap the gas stream, Tennessee has built a stripping plant on its line at Gabe in Green county near Summersville, Ky.

The hydrocarbon plant itself is located at Doe Run near Brandenburg, Ky., and a 60-mile pipeline has been constructed from the stripping plant to Doe Run. Organic chemical products will include ethylene glycol, ethylene oxide, diethylene glycol, and ethylene dichloride; petroleum products to be produced are commercial butane and propane, isobutane, and natural gasoline.

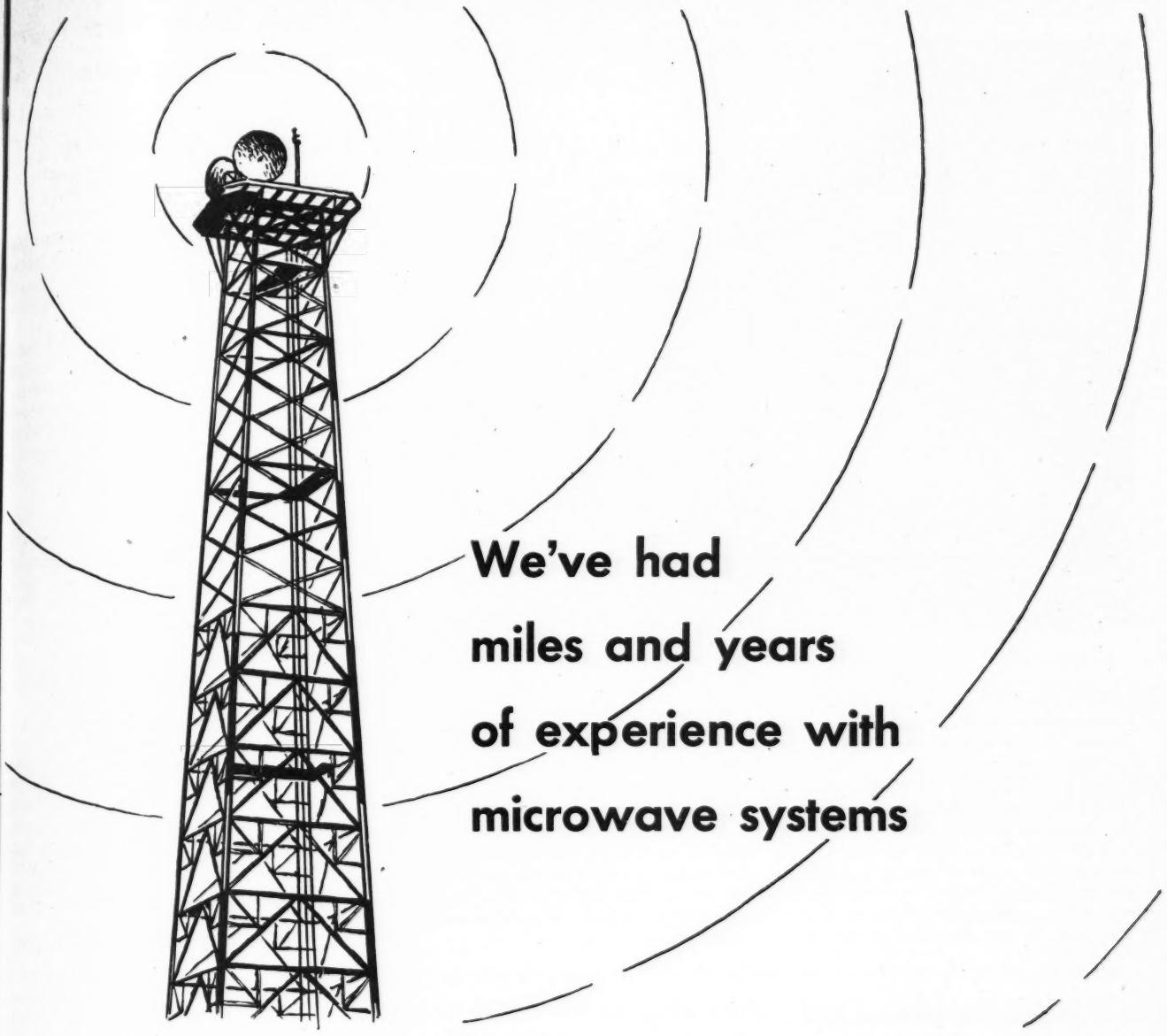
J. G. Woods is manager of the new plant.

An interesting development occurred at the outset of construction of the San Juan line. More than 200 miles of this line runs through the Navajo Indian Reservation in an area rich in ruins and relics of great archaeological value. Under federal statutes, these ruins may not be disturbed except with the concurrence of officials of the National Park Service of the Department of the Interior.

In order for the park service to act expeditiously and intelligently it would have been necessary for it to have trained personnel to accompany both the company's right - of - way crews and the ditching machines and "back-hoes" cutting the ditch for the line. An undertaking of such magnitude would have required the hiring of many additional men and an increased appropriation for the service. To arrange such matters in normal course would have caused a delay of six to nine months, and such delay would have meant hundreds of thousands of dollars of added expense to the company because it was necessary to complete construction work through this area before the winter snows closed in.

To solve this dilemma, the company put the necessary archaeological crews on its payroll and the construction program proceeded with a minimum of delay. Numerous buried "pit-houses" and other interesting prehistoric Indian relics were located and unearthed along the right-of-way. This cooperative arrangement created a great deal of good-will and favorable publicity for the company, besides avoiding the substantial loss that would have resulted for the company if the arrangement had not been made.

—*Annual Report for 1950, El Paso Natural Gas Co.*



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Construction of this 1200-ft section of 20-in. welded steel transmission main across the Menomonee valley in Milwaukee required employment of some unique methods by Milwaukee Gas Light Co. crews. The pipe, which hangs suspended from the Wisconsin avenue viaduct, crosses the valley, railroad lines, a river, and industries lying below the bridge.

Since scaffolds couldn't be built over the river and railroad tracks, a special movable scaffold, partly on the viaduct and partly hanging over the side of it, was built. It was moved from west to east while crews attached brackets and hangers; then it was moved across in the opposite direction when 40-ft sections of pipe were swung over the lights and concrete railing of the viaduct, lowered into the brackets, and welded. Again it was moved the length of the structure when painters went to work.

Completion of the main means Milwaukee Gas Light's West Side station and its Hawley Road station are connected, and a dependable supply of natural gas to areas of heavy demand is assured under all conditions.

Los Angeles Companies Ask Facilities to Up Capacity

A joint application for authorization to build facilities to carry an additional 150 MMcf per day to southern California markets has been filed with the FPC by Southern California Gas Co. and Southern Counties Gas Co., both of Los Angeles.

They propose to build 81 miles of 30-in. line paralleling the existing line between Whitewater and Desert Center, Calif.; a 6-mile, 30-in. loop between the Blythe, Calif., compressor station and the California-Arizona boundary; and install two 1760-hp compressors at Blythe. Cost is set at $7,767,525.

El Paso Natural Gas Co., the supplier, has an application pending for construction of facilities needed to deliver the additional gas.

Mississippi Amends Plan

An amended application for authority to develop the Waterloo, Ill. oil field as an underground storage reservoir for natural gas has been filed with FPC by Mississippi River Fuel Corp., St. Louis. Last January the commission granted a temporary certificate for exploration of the field's possibilities.

As now proposed, the project would include about 16.2 miles of line, about 25 wells, an 1800-hp compressor station, a 75-MMcf/d compressor station, liquid separators, and pressure regulating and metering stations. The revised cost estimate is $2,953,125.

Columbia Subsidiaries Ask for FPC Approval

Three Columbia Gas System subsidiaries —Manufacturers Light & Heat Co., Cumberland & Allegheny Gas Co., and Home Gas Co., all of Pittsburgh—will spend $1,853,063 for construction and retirement of facilities on their systems in four states if FPC approval is granted.

Manufacturers proposes to build about 26 miles of line, to retire 18 miles of line and a 125-hp compressor station, and to convert 3 miles of transmission line to medium pressure distribution service. The work is located in seven Pennsylvania counties and Hancock county, W. Va.

Cumberland wants to build 13 miles of line and to retire the same amount in Preston and Barbour counties, W. Va. and Allegany county, Md. Home asked for authority to construct 16 miles of line paralleling an existing line in Steuben and Chemung counties, N. Y.

No new markets would be served.

Cities Service Plans Two New Storage Fields

Cities Service Gas Co., Oklahoma City, will develop two depleted gas fields in Kansas for underground storage if the FPC approves its application. The company wants to acquire the Colony field in Anderson county and the McLouth field in Leavenworth and Jefferson counties, and to construct necessary facilities, as well as to replace 10 miles of double 16-in. line with a single 26-in. line between its Welda and Ottawa compressor stations.

Cost is estimated at $1,035,000 for Colony field, $2,017,627 for McLouth field, and $419,000 net for replacement of the lines. Cities Service believes it will be able to secure gas storage leases on a substantial portion of each field but, if this is impossible, storage rights will be secured by condemnation proceedings under a new Kansas law.

Capacity Increase Sought

An $802,340 project to increase capacity of its West Virginia system has been presented to FPC by Amere Gas Utilities Co., Charleston.

Construction would include about 2 miles of line in Wyoming county to reinforce the gas supply to Mullens, 16.5 miles in Mercer county to supply added requirements of Princeton and Athens and to pipe gas at wholesale to Bluefield Gas Co., and 15 miles of line in Raleigh and Mercer counties to transport gas from Atlantic Seaboard Corp.'s system to Amere's distribution operations in Beckley during winter months.

FPC Okays United Project

United Natural Gas Co., Oil City, Pa., has received FPC authorization to build additional natural gas facilities on its system in northwestern Pennsylvania to enable the company to transport more gas during peak demand periods.

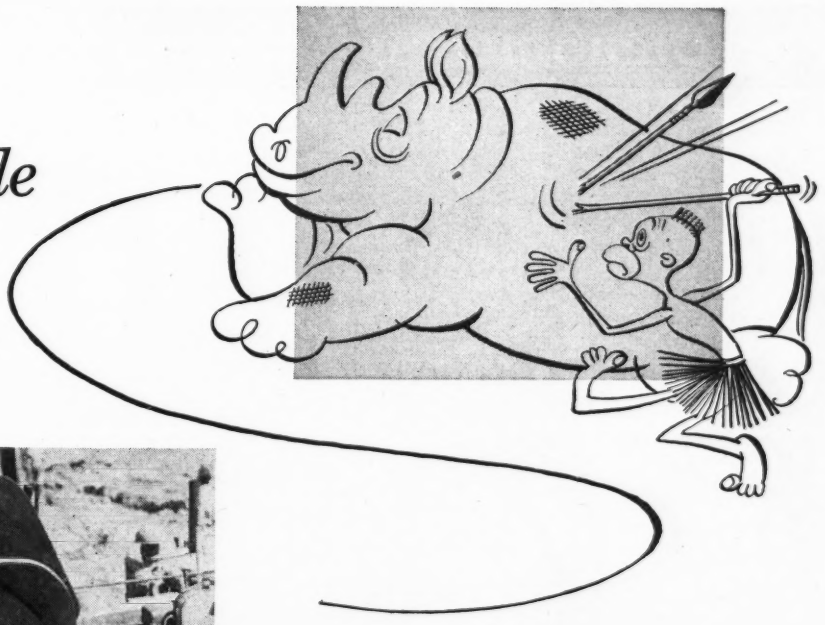
United will construct about 10 miles of line in Elk, McKean, and Venango counties, replace 8 miles, and install a 150-hp compressor unit at its Hickory station and another at its Pinegrove station. Estimated cost is $654,500.

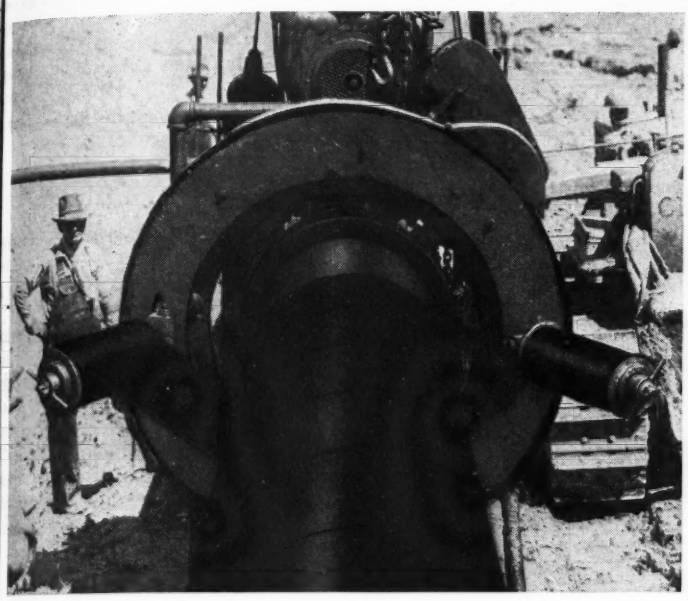
Pipeline Newsnotes

A 40-ft bare aluminum bypass installed 1½ years ago (see *GAS*, Nov. 1949, p. 98) recently was uncovered by Alabama-Tennessee Natural Gas Co., Florence, Ala., and the 8-in. line showed no discoloration or corrosion. This section was installed with special bypass valves so that it could be dug up for inspection at intervals without interrupting service to the Reynolds Metals Co. plant at Listerhill, Ala. Officials of Alabama-Tennessee and representatives of Reynolds supervised the test. Pipe for the 9500-ft lateral was supplied by Reynolds.

Rockland Light & Power Co., Nyack, N. Y., is seeking FPC permission to build a 22-mile transmission line between Orangetown and Tomkins Cove, N. Y. to carry gas

Like the Rhino's tough hide that protects what's inside...





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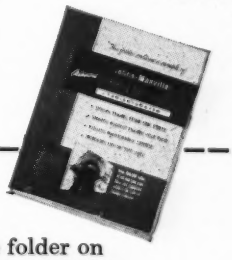

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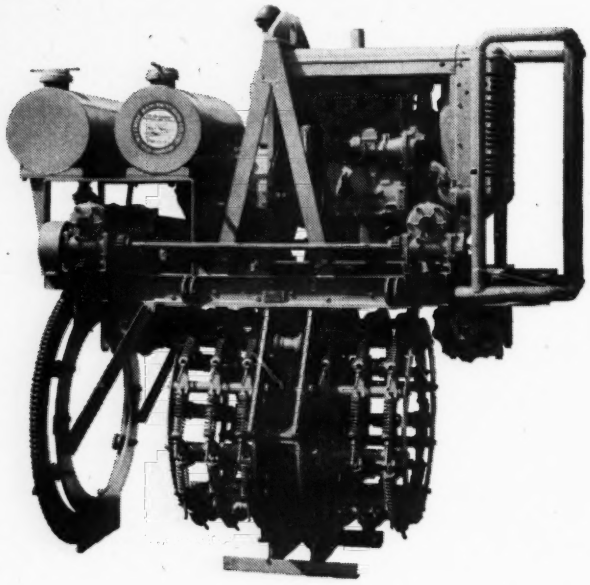

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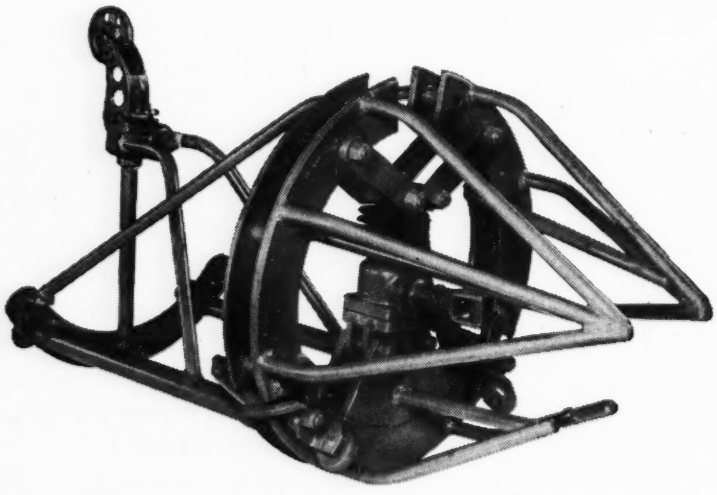

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purchased from Transcontinental Gas Pipe Line Corp., Houston. The company also wants the commission to direct Transco to connect and supply the proposed line at Orangetown. Estimated to cost $753,315, the line would have a capacity of 11 MMcf/d. Gas would be destined for Rockland's eastern division in New York state.

An FPC certificate for 44 miles of 8⅝-in. line to be built in Monterey county, Calif., and for 31 miles of existing line in Monterey and San Benito counties has been requested by Pacific Gas & Electric Co., San Francisco. The existing line has been supplied from California-produced gas but, if certificated by FPC, will be used to transport out-of-state gas when necessary. Cost of the 44-mile line—which would run from near Salinas through Chualar, Gonzales, Soledad, and Greenfield to King—is estimated at $678,600.

Panhandle Eastern Pipe Line Co., Kansas City, Mo., has applied for FPC approval of a $3,085,000 project which would up its system capacity by 50 MMcf a day, to 850 MMcf. Facilities include a 2000-hp unit at Tuscola, Ill. and two 2000-hp units at Edgerton, Ind. station; 6.5 miles of 26-in. near Houstonia, Mo.; a 7.24-mile extension of a 30-in. line east of Zionsville, Ind.; and 18.2 miles of 26-in. from Edgerton station into Ohio.

Hearing will begin Aug. 6 on two applications of Southern Natural Gas Co., Birmingham. One project—including 169 miles of pipeline and 19,450 hp at three new stations—would increase system capacity from 555 to 670 MMcf. The other requests permission to build measuring facilities instead of lateral lines previously authorized for delivery of gas to Hogansville and Grantville, Ga. and Childersburg, Ala.

When the Kansas floods caused a break in Michigan - Wisconsin Pipe Line Co.'s main line near Wamego, Kan. last month, eight Wisconsin utility customers were served gas withdrawn from the firm's underground storage fields near Big Rapids, Mich. The break was expected to be repaired in about seven days. Repair crews and emergency pipe and equipment were on hand waiting for the water to recede.

Gov. John Davis Lodge of Connecticut last month signed a bill authorizing the regulation of natural gas pipeline companies by the state public utilities commission in cases where safety of the public and of company personnel is involved. In Hartford, Superior Court Judge John H. King granted Northeastern Gas Transmission Co. "right of immediate entry" upon nine sections of property in Hartford county.

FPCommissioner Claude L. Draper recently took the oath of office for his sixth term as a member of the regulatory body. He was originally appointed by President Hoover in 1930.

FPC has approved a proposal of Colorado-Wyoming Gas Co., Denver, to build laterals and meter stations to supply natural to Public Service Co. of Colorado, its parent, for resale in Westminster, Eastlake, Lafayette, Louisville, Campion, and Mount Olivet, an un-

corporated area, all in Colorado. In addition, Colorado-Wyoming will supply Greeley Gas & Fuel Co. with natural for resale in Pierce, Nunn, and Platteville. Certain facilities are to be abandoned, replaced, and sold as part of the $771,850 project. Net property increase is estimated at $542,094.

United Gas Pipe Line Co., Shreveport, has placed an order of nearly $2 million with Cooper-Bessemer Corp., Mount Vernon, Ohio, for 16 compressors. The contract represents an addition of 24,000 hp to boost existing pumping facilities of United Gas.

PIPELINE PEOPLE

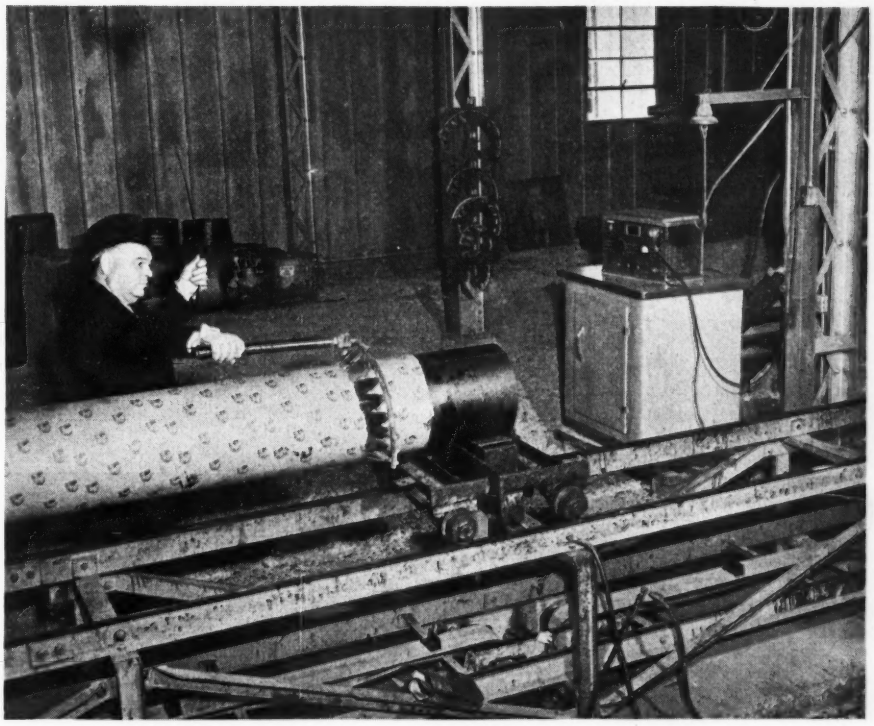
Promotion of THOMAS E. EAGAN to the new post of research metallurgist for Cooper-Bessemer Corp., Mount Vernon, Ohio, was announced last month. He was formerly supervisor of the firm's laboratory, a position which has been taken over by W. R. McCRACKEN, who will also supervise materials control of foundry operations at the Mount Vernon and Grove City, Pa. plants. The company also has added three chief engineer's assistants: T. O. KUIVINEN to handle technical matters, R. F. KYMER as coordinator of engineering and production activities, and W. R. CROOKS to assist in a general administrative capacity and to work on research and development projects. I. W. FERGUSON, assistant works manager, has been promoted to the new position of manager, quality control. He was succeeded by E. C. PHELPS.

T. E. Eagan

Executive promotions announced by the board of directors of De Laval Steam Turbine Co., Trenton, N.J., include those of JAMES P. STEWART from executive vice president to president; W. A. NEUMANN JR. to vice president of industrial sales; H. G. BAUER to vice president of engineering; and CHARLES A. JURGENSEN to vice president of manufacturing. Mr. Bauer will continue as manager of marine sales and Mr. Jurgensen as works manager.

HERMAN H. MILLER recently resigned his position as manager of the compressor division of Worthington Pump & Machinery Corp., Buffalo, N.Y., and E. A. MURRAY has been appointed his successor. Mr. Miller, associated with Worthington for 50 years, will remain with the company for six months as consultant to Mr. Murray, formerly assistant manager of the division.

New York State Natural Gas Corp., Pittsburgh, has appointed ROY C. PATTERSON as southern district superintendent with headquarters at Tonkin station in Murrysville, and GEORGE M. DAUDET as chief engineer of the Tonkin station, succeeding MELBOURNE L. BLUE. Mr. Blue will assume the duties of chief engineer of New York State's South Bend station.



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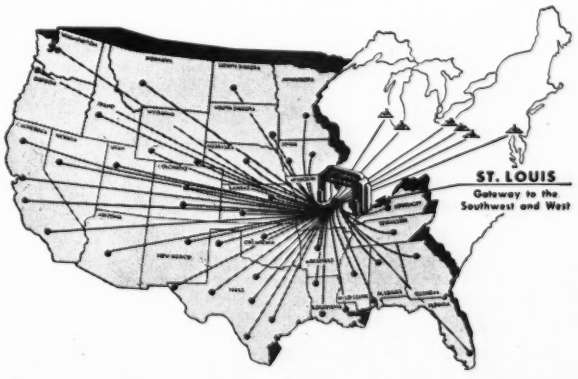

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... Tractor Sales

Texas Eastern Transmission Corp., Shreveport, has announced formation of Operating Division 5 with offices at Lebanon, Tenn., to cover the area from Kosciusko, Miss. to the northern boundary of Tennessee. EDWARD J. KENNELLY has been named manager and WILLIAM FALLEAF assistant manager. PAUL L. HUGHEN, division manager at Baytown, Texas, has replaced Mr. Kennelly as manager at Downingtown, Pa. and WILLIAM C. BRITT, assistant manager at North Little Rock, Ark., has taken over as Baytown manager. At Baytown, EARL HUMBLE has been promoted from division engineer to assistant division manager, the post formerly held by Mr. Falleaf. ROBERT S. COOPER, engineer at North Little Rock has moved up to assistant manager there.

Fritz von Schlegell, president of Tractor Sales Corp., Los Angeles, has announced the appointments of GEORGE R. VETTER as his assistant and of ROBERT D. LINN as office manager. Mr. Vetter was previously associated with Westways Realty Co. and Mr. Linn with A. O. Miller Waterproofing & Paint Co., both of Los Angeles.

Included among several additions to the staff of Dowell Inc., Tulsa, are ELLSWORTH W. HUDGENS, as a development engineer, R. W. STETSON as sales representative in New York City, and WILLIAM E. BUNTING as Chicago sales representative. Dowell's cathodic protection sales division manager is HERB WALTHER, recently transferred to Tulsa from the company's Richmond, Va. office.

Mississippi River Fuel Corp., St. Louis, recently announced the retirement of BEN C. COMFORT as chairman of the board and director of the corporation. HOWARD D. GRAHAM, vice president in charge of operations, was elected a director to fill the board vacancy, but the chairmanship will remain open. Mr. Comfort, one of the company's founders, will continue his affiliation in a consulting capacity.

Southern Natural Gas Co., Birmingham, has named O. W. CLARK, former superintendent of compressor stations, as general superintendent in charge of the operating department. At the same time, CHARLES M. HUNTER was moved up from assistant to the general superintendent to assistant general superintendent.

Republic Natural Gas Co., Dallas, has appointed W. BAXTER BOYD, oil geologist, as manager of exploration. J. H. HESTER, drilling superintendent, has been promoted to general superintendent and C. C. BOOK has been named Mr. Hester's assistant.

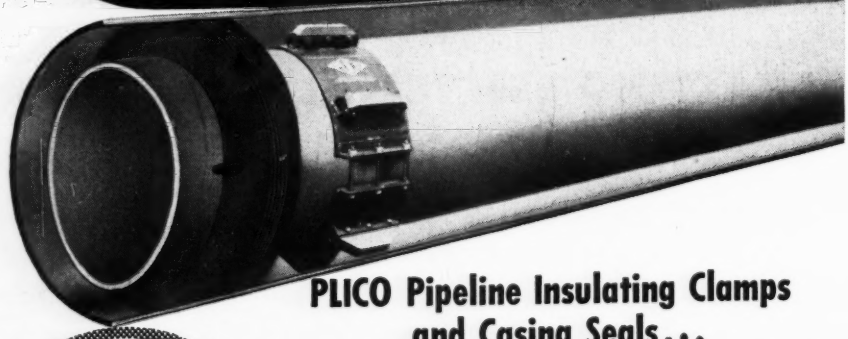
Newly appointed superintendent of Panhandle Eastern Pipe Line Co.'s transmission operations is GEORGE T. KOCH, former head of transmission compressor stations. FRANCIS J. McELHATTON has succeeded Mr. Koch.

EDWARD B. MARSH, FPC hearing examiner for 13 years, has been named Washington representative of Transcontinental Gas Pipe Line Corp., Houston. He will have offices in the Shoreham hotel.

Obituary

JOHN L. CUMMINGS, 61, a pipeline pioneer in the Southwest, died June 21 in Liberal, Kan. He was a consultant for Panhandle Eastern Pipe Line Co. at the time of his death.

NO CATHODIC PROTECTION FAILURES WITH PLICO CASING INSULATION!



PLICO Pipeline Insulating Clamps and Casing Seals...

- Prevent Casing "Ground-outs"
- Eliminate Leaks
- Reduce Maintenance Cost
- Decrease Rectifier Costs
- Low Installation Cost
- Excellent for Repair of Old Casing Failures

CT 700 RUBBER GROUT COMPRESSION TUBE

(For new installations)

Specially engineered, extra heavy duty butyl rubber durable for the life of the line. New design valve stem permits easy inflation of tube with Plico Compounded Grout.

SR 300 SPONGE RUBBER GASKETS

(For repairing old casing jobs)

A soft, porous wrap sponge rubber gasket for effectively sealing off the annular space at ends of casing... works in combination with Plico (Poly-Seal No. 80) hot melt compound.

Digging into the facts and figures on the Plico Insulation System now can save you from digging into the hard ground later on, because the Plico System is the pipeline engineer's insurance against "ground-outs."

- Plico's Compression Tube Sealing System provides a permanent seal... is permanently flexible, versatile and the ease of installation reduces labor costs. With Plico there is no possibility of water leakage into casing.
- Plico Insulating Clamps are precision manufactured to fit your carrier line and reduce coating distortion... ruggedly constructed to withstand severe abuse.

Only Plico can give you complete protection for your casing insulation and sealing problems. Write or wire for technical brochure describing the Plico System in detail.

PLICO

Patents Pending

PIPELINE COATING & ENGINEERING CO.

3480 East Randolph Street, Huntington Park, Calif.

(A few choice areas still available for Distributors)

PROGRESS REPORTS

Planned

AERE GAS UTILITIES CO., Charleston, W. Va. cket G-1716 for 33.6 miles of line in West rginia.

RKANSAS-MISSOURI POWER CO., Blytheville, k. To build line from Big Inch to serve 12 wns in two states. To start within year.

SSOCIATED NATURAL GAS CO., Tulsa. Docket -1689 for 88 miles of line, town border and stribution regulator stations and distribution cilities to serve 14 towns in Missouri.

TLANTIC SEABOARD CORP., Charleston, . Va., for a 3520-hp station in Randolph ounty on its Cobb-Rockville line.

ENTRAL KENTUCKY NATURAL GAS CO., harleston, Docket G-1666 for 18.6 miles of 2¾-in. from Winchester to Lexington, Ky.

ENTRAL KENTUCKY NATURAL GAS CO., harleston, Docket G-1648 for 12.8 miles 20-n. loop northeast from North Means, Ky.

ENTRAL WEST UTILITY CO., Kansas City, Docket G-1682, four alternate plans to serve lay county, Mo.

ITIES SERVICE GAS CO., Oklahoma City. Docket G-1704 for a 10-mile, 26-in. line be-ween its Welch and Ottawa stations in Frank-lin county, Kan.

ITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.,** sub-sidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

UMBERLAND & ALLEGHENY GAS CO., Pitts-burgh. Docket G-1732 to build 13 miles of line and to retire the same amount in West Virginia and Maryland.

AST TENNESSEE NATURAL GAS CO., Knox-ville. Dockets G-1065 and G-1517 for three laterals totaling 8 miles, together with physical connections, metering measuring, and regu-lating equipment. Docket G-1336 for a 100-mile, 16-in. line from near Knoxville to Kings-port, Tenn. with appurtenant equipment.

EL PASO NATURAL GAS CO. Docket G-1629 for 10.4 miles 30-in., 36 miles field lines, 37,-160 hp in main line stations, 18,910 hp in field stations, field gathering systems, and miscel-laneous facilities.

EL PASO NATURAL GAS CO. Docket G-1631 for 112.9 miles 30-in., 179.5 miles field lines, 98,200 hp added capacity plus 36,540 hp in field stations, field gathering systems, and mis-cellaneous facilities.

EL PASO NATURAL GAS CO. Docket G-1630 for 25,050 hp at new and existing stations, 50.9 miles field lines, 2700 hp at a field plant, gas wells and miscellaneous facilities.

GULF-MICHIGAN GAS TRANSMISSION CORP., St. Louis, for 680-mile, 30-in. line from Perry-ville, La. to St. John, Ind. with three compressor stations totaling 30,800 hp.

HOME GAS CO., Pittsburgh. Docket G-1732 to build 16 miles paralleling an existing line in Steuben and Chemung counties, N. Y.

IOWA-ILLINOIS GAS & ELECTRIC CO., Daven-port. Docket G-1721 for a 41-mile, 10-in. line from Washington county to Cedar Rapids, Iowa.

KANSAS-NEBRASKA NATURAL GAS CO., Hast-ings, to build 117 miles of 2⅜-, to 8⅝-in. line in Nebraska, four town border stations and laterals, measuring and regulating equipment.

MANUFACTURERS LIGHT & HEAT CO., Pitts-burgh. Docket G-1732 to build 26 miles of line, retire 18 miles and a 125-hp station, and convert 3 miles transmission line to distribution in Penn-sylvania and West Virginia.

MICHIGAN CONSOLIDATED GAS CO., 130-mile, 24-in. line paralleling present line from storage fields at Austin, Mich. to Detroit.

MICHIGAN GAS STORAGE CO., Jackson, for 78 miles of 16-, 22-, and 24-in. line from Laings-burg Junction to near Pontiac-Mt. Clemens, 3 laterals, 7400 hp, and 30 miles 26-in. loop. All for development of the Riverside storage field.

MISSISSIPPI RIVER FUEL CORP., St. Louis. Docket G-1581 for development of Waterloo, Ill. storage field, 16.2 miles of line, an 1800-hp station, and other facilities.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo. Docket G-1509 for 25 miles of 6-in. from Moberly to Macon, Mo.

MONTANA POWER CO. Butte, 8-in. line from Hart Mountain field, Wyo. to Warren, Mont. and convert an oil line from Warren to Billings.

MONTANA POWER CO., Butte. Docket G-1712 for 18 miles 16-in. from Pakowki Lake area in Alberta to Montana state line and 52 miles 16-in. from there to near Cut Bank, Mont.

NATIONAL UTILITIES CO. OF MICHIGAN, Coldwater, Mich., 77 miles in south central Michigan.

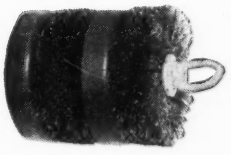
NATURAL GAS STORAGE CO. of Illinois, Chi-cago. To build facilities to develop an under-ground storage area 15 miles southwest of Kan-kakee, Ill.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Henderson, Las Vegas, and North Las Vegas, Nev.

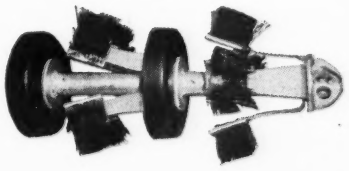
NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

THE PIG WITH THE POKE — CLEANS PIPE LINES

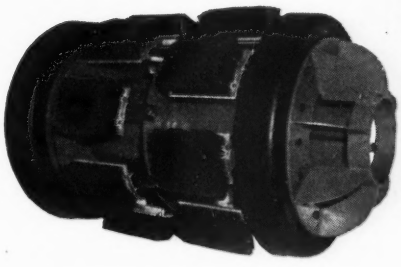
THE VERY LATEST
Williamson Pipe Line Pigs*
FOR CLEANING
NATURAL GAS PIPE LINES



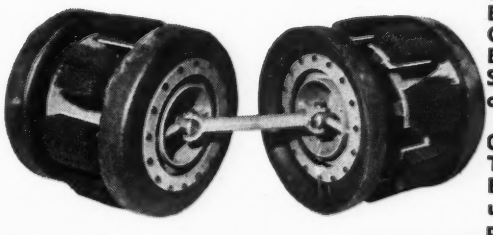
4" Size—TYPE JRN. 2" to 4" sizes. Will pass 1½ R-90° Bends. No valves other than full diameter thru port valves. Use TYPE SCN-51 for 6" size.



8" Size - TYPE WC-11. 8" to 14". Will traverse 6-foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.



20" Size - TYPE GP-2. 16" to 30" 200-lb. SPRING forces the brushes against pipe wall — COMPEN-SATING for WEAR. Will traverse round opening gate or plug valves. SPRINGS and BRUSHES are identical and interchange-able for all types and sizes of GP-PIGS.



24" Size - GP-3. 18" to 30". Sizes will pass 1½ R-30° Bends. SPRINGS COMPENSATE for BRUSH WEAR AS-SURING full section cleaning efficiency.

GP-3 consists of two Type GP-1 Pigs— Each Unit may be used as individual pig.

*Patents Pending

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

CREWS of Tulsa (Okla.) Pipe Coating Co. are shown coating pipe for a 225-mile, 4- to 12-in. gathering system for Northern Natural Gas Co. at Hugoton, Kan. Work got under way in June.

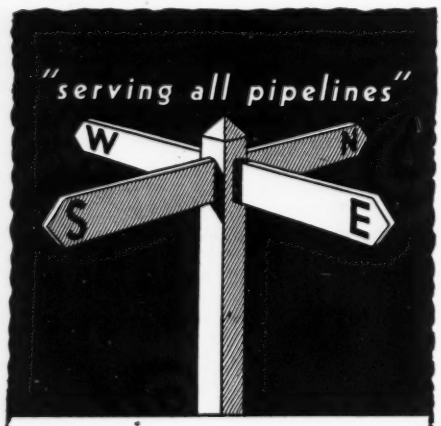
NEW YORK STATE NATURAL GAS CORP., Pittsburgh, Docket G-1701 for a 6600-hp station at Dryden, N. Y. and 35.2 miles 20-in. loop from there to the Therm City station.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-1442 and G-1511 for 13.9 miles of branch and a measuring and regulating station near Humboldt, Iowa and 1.5 miles of branch and a similar station near La Platte, Neb.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

OHIO FUEL GAS CO., Columbus, Docket G-1639 for 61.3 miles in Sandusky, Elyria, and Dayton, Ohio areas.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1651 for 141 miles 34-in. loop and 22,780 hp at authorized stations.



PIPELINE COATINGS
and
WRAPPING MATERIALS

S. D. DAY COMPANY

1973 WEST GRAY HOUSTON, TEXAS PHONE JU-2431

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. Docket G-1705 for 6000 hp at existing stations, 24.7 miles 26-in. and 7.24 miles 30-in.

PIEDMONT GAS CO. INC., Hickory, N. C. Docket G-1617 for 28 miles 6-in. line, metering and regulating stations.

ROCKLAND LIGHT & POWER CO., Nyack, N. Y. Docket G-1728 for 22 miles transmission line between Orangetown and Tomkins Cove, N. Y.

SHENANDOAH GAS CO., Lynchburg, Va., for 59 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTHERN CALIFORNIA GAS CO., Los Angeles. Docket G-1698 for a 35-mile line in the Antelope valley, Calif.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-1718 for 81 miles 30-in. line between Whitewater and Desert Center, Calif., 6 miles 30-in. from Blythe, Calif. station to Calif.-Ariz. border, and two 1760-hp compressors at Blythe. Docket G-1743 for a 23.5-mile line in California from Inglewood to Los Angeles.

SOUTHERN NATURAL GAS CO., Birmingham, 169 miles of various size pipeline and three compressor stations totaling 19,450 hp in Alabama, Georgia, Mississippi and Louisiana.

SOUTHWESTERN VIRGINIA GAS TRANSMISSION CO., Martinsville. Docket G-2237 for 17-mile line from Transco's line near N.C.-Va. state line to Martinsville.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas & New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river.

TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 642 miles main and loop in La., Ark., Miss., Tenn., and Ky. Includes 189-mile line from Acadia parish to Morehouse parish, La. (24- and 26-in.) and 425 miles 26-in. loops. Also 5280 hp near Madison, Ind.; 9340 hp at 4 existing stations; underwater crossings of Ohio and Mississippi.

TRANS-CANADA PIPE LINES LTD., for a 2200-mile line from Alberta to major cities as far east as Montreal.

UNITED FUEL GAS CO., Charleston, to build 45 miles in West Virginia, 2640-hp compressor station with dehydration plant, and transfer 1000-hp unit from Walgrove to Kanawha station. H. L. Gentry Construction Co. has contract for 32 miles of 20-in. line near Charleston, W. Va.

UTAH NATURAL GAS CO. to build a 360-mi line from the San Juan basin to Salt Lake City. secondary line would run from Last Chance fie (Wayne county, Utah) through Sevier and Sa pete counties.

UTAH PIPE LINE CO., Dallas, for a 392-mile li from Aztec, N. M. to Salt Lake City. Includ 374 miles of 22-in. and 18 miles of 16-in.

WESTCOAST TRANSMISSION CO. INC., W mington, Del., 615 miles, including 277 mi from Sumas, Wash. to Portland, Ore. with sh branches to a number of cities in the two sta 266 miles south from the Osoyoos, B. C. area Spokane and Hanford, Wash.; and 72 miles laterals and 13 measuring stations.

Approved

PACIFIC GAS & ELECTRIC CO., San Francis Docket G-1709 for a 44-mile, 8⅝-in. line Monterey county, Calif.

UNITED NATURAL GAS CO., Oil City, Pa. 10 miles new line and to replace and reloc 10 miles all in Elk, McKean, Venango, and M cer counties. Add 150-hp units at Hickory a Pinegrove stations and a generator at Ki station.

Under Way

ALGONQUIN GAS TRANSMISSION CO., Bost facilities to serve designated companies in Ma R. I., Conn., and N. J. Includes 253 miles main line and 279 miles of laterals.

CAROLINA NATURAL GAS CORP., Charlot N. C. Docket G-1335 for 67.5 miles, consisti of two sales laterals to Transcontinental G Pipe Line Corp.'s system.

CITIES SERVICE GAS CO., Oklahoma City, O Knupp Construction Co. Inc., at work on miles 16-in., Wichita to Newton; taking up miles 6-, 8-, and 10-in. near Newton.

CITIES SERVICE GAS CO., Oklahoma City, O Cheek Construction Co. at work on 100 mi of 4-, through 20-in. gathering system east Ulysses, Kan.

CITIES SERVICE GAS CO., Oklahoma City, work on 56 miles of 16-, 10-, and 3-in. line Kansas and 13,080 hp at new and old station

COLORADO INTERSTATE GAS CO., Colorad Springs, 30 miles 20-in. loop from Elbert coun to Limon, Colo., 19 miles 6⅝-in. lateral in Fo Lyon, Colo., connecting system to recently a thorized 216-mile line; increase Panhandle com pressor station capacity from 4800 to 6600 hp install additional 1320-hp unit at Kit Carso Colo. R. H. Fulton Construction Co. at work o 216-mile line and 30 miles of 20-in. loop lin

COLORADO INTERSTATE GAS CO., Colorad Springs, a 215-mile, 20-in. line from the Texa Panhandle to Colorado.

COLORADO-WYOMING GAS CO., Denve Docket G-1534 for lateral lines and meter sta tions to supply gas to Public Service Co. Colorado, its parent; add 2400 hp at its Me compressor station; replace 1½ miles of Fort Warren lateral with larger pipe; and re place 4 miles of 4-in. (Golden lateral) wi 8-in.

EAST OHIO GAS CO., Cleveland. Docket G-157 for a 65-mile, 26-in. line from near Petersbur Ohio to west of Twinsburg, Ohio.

EL PASO NATURAL GAS CO., 451 miles 24-i main from San Juan county N. M. to Topoc Ariz., related plant facilities, gathering lin and laterals. Also a compressor station ne Ganado, Ariz. and a gasoline treating compre sor plant near Fruitland, N. M.

EQUITABLE GAS CO., Pittsburgh, Poston Co struction Co. at work on 15 miles 16-in. o north and west sides of Pittsburgh. H. L. Gent Construction Co. at work on 17 miles of 16-i north of Pittsburgh.

GRAND VALLEY PIPELINE CO., Denver, a 10

On every job, we emphasize

Personal Supervision

Remember, when TROJAN handles your pipeline construction jobs, you get the full benefit of an organization of experienced personnel, ample equipment and financial stability.

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NICOLET FELT MEANS FAST, PRECISION WRAPPING WITHOUT BRAKES

Nicolet Felt is a strong, thick sheath of asbestos in solid roll lengths. Its high tensile strength and accurate mat make-up afford fast, precision wrapping without time consuming breaks.

Nicolet Felt forms a rugged shield against damage to pipe from soil stress, lowering-in, back-filling, abrasive movement and corrosion.

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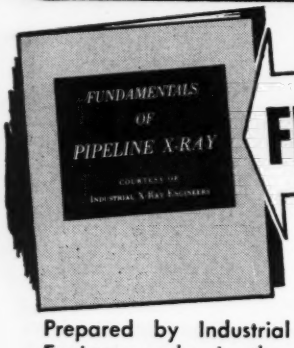

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mile, 8- and 10-in. line from Piceance creek to Grand Junction and Rifle, Colo.

HOPE NATURAL GAS CO., Clarksburg, W. Va., has Pipe Line Construction & Drilling Co. working on 34 miles of 8-, 10-, and 12-in. line from Fairmont, W. Va. to Terra Alta, W. Va.

HUGOTON PRODUCTION CO. has Reese Bros. Construction Co., Hugoton, Kan. at work on a 45-mile, 3- to 22-in. gathering system in the Hugoton gas field, 20% completed.

KANSAS NEBRASKA NATURAL GAS CO. INC., Hastings, Neb., has Engineers Limited Pipeline Co. working on submerged crossings of the Loup and Cedar rivers in Nebraska.

LAKE SHORE PIPE LINE CO., Cleveland, Ohio, 45-mile, 10¾-in. line from Meadville, Pa. to Ashtabula, Ohio.

MISSISSIPPI RIVER FUEL CORP., St. Louis, has Houston Contracting Co. at work on a 98-mile, 16- and 18-in. feeder line from Lincoln parish, La. to Woodlawn, Texas, gas field. Mississippi also building an 11-mile, 10-in. lateral to Waskom field, Texas.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, 16 miles connecting lines between facilities acquired from 3 companies in Montana and Wyoming. Compressor station with two 330-hp units and dehydration facilities, together with addition of two 880-hp units to an existing compressor station.

NEW YORK STATE NATURAL GAS CORP., New York. Williams Austin Co., Pittsburgh, is at work on 82½ miles 20-in. from Utica to Ithaca and 12 miles 16-in. from Knox to Schenectady, N. Y.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1622 for a 39-mile, 20-in. line from Potter county, Pa. to the boundary between Livingston and Monroe counties, N. Y.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1601 for a 77-mile, 20-in. line from Lawrence county, Pa. to the South Bend storage area, 17 miles of field lines, and a 12,000-hp station. Fish Engineering Co. is building the station.

NIAGARA MOHAWK POWER CORP., Syracuse, under Docket G-1311 has Williams-Austin Co., Pittsburgh, at work on 40 miles of 10-, 12- and 16-in. laterals.

NIAGARA MOHAWK POWER CORP., Syracuse, under Docket G-1475 is building a 55-mile 10¾-in. line to supply Watertown and other communities.

NORTHEASTERN GAS TRANSMISSION CO., Springfield, Mass. 500 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass., and from Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in. from Pittsfield to Wakefield, Mass. to be built by Oklahoma Contracting Co.; and 225 miles 3- to 12-in. laterals, and 35 meter stations, all to be constructed in 1951.

NORTHERN NATURAL GAS CO., Omaha, has Reese Construction Co. at work on 181 miles of 4- to 16-in. gathering system in Hugoton, Kan. To be completed Dec. 31. R. H. Fulton & Co. on 24-in. underground crossing of Cimmaron river, Ulysses, Kan. G. G. Griffis Construction Co. at work on 217-mile, 26-in. line from Palmyra, Neb. to Skellyville, Texas. Tulsa Pipe Coating on 80 miles of 26-in. from Adams, Neb. to Clifton, Kan. and 225 miles of 4- to 12-in. gathering system in Hugoton, Kan.

OHIO FUEL GAS CO., Columbus, Docket G-1594 for 74 miles storage project lines, 47½ miles 20-in. from proposed storage areas to markets, and 8480 hp for storage service. In Ashland, Hocking and Knox counties, Ohio.

PACIFIC GAS & ELECTRIC CO., San Francisco, has Bechtel Corp. building compressor stations at Topock, 6 compressors totaling 15,000 hp; Hinkley, 7 compressors totaling 17,500 hp; and Kettleman Hills, 8 compressors totaling 12,320 hp.

Beveling machine shapes end of 30-in. pipe during construction in Mississippi on Texas Eastern Transmission Corp.'s Kosciusko-Connellsville line. The big carrier is scheduled for completion in October.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, has R. H. Fulton & Co. on 20 miles 24-in. and 48 miles 26-in. in five loops from Sneed, Texas, to Olpa, Kan.

PANHANDLE EASTERN PIPE LINE CO., Kansas City. Midwestern Constructors 80% complete on 3 compressor station additions.

PENNSYLVANIA GAS CO., Warren, 52-mile 12¾-in. line from Warren to Erie, Pa. and new compressor units.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, Docket G-1407 for 169 miles of laterals to Transcontinental and Piedmont Natural lines and 25 distribution systems in North Carolina. Lateral to Gastonia now under construction.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles, Alex Robertson Co. and Engineers Ltd. Pipeline Co. 24 miles 30-in. encircling Los Angeles metropolitan area. To be completed Oct. 15. SoCal has J. E. Young Pipeline Construction Co. and N. P. Van Valkenburgh Co. at work on 21-mile loop from tie-in point near Simi to east bank of Santa Clara river, to be completed Sept. 15.

SOUTHERN NATURAL GAS CO. Birmingham, has Latex Co. of Georgia at work on 35.31 miles of 8⅝-, and 8¼-in. from Opelika, Ala., to La Grange, Ga.

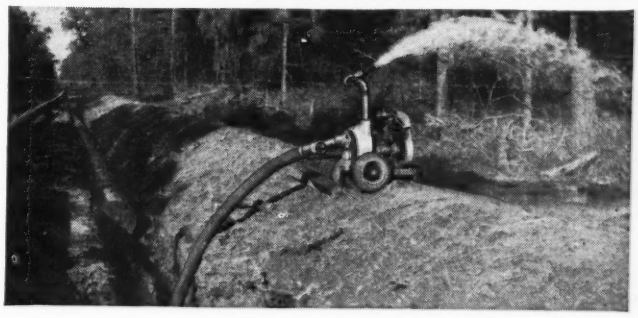
TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass. line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals. H. C. Price Co. is building 156 miles of 24-in. line from Hamburg, N. Y. to the Onondaga-Madison county line 65% completed. Houston Contracting Co. is at work on 46 miles of 30-in. line from Galion to Eros, La. Bechtel Constructors Inc. at work on 120 miles 24-in. from Hamburg, N. Y. to Hudson river.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1614 for 89,530 ft of line and appurtenant facilities and 21,120 hp in a new station in Hebron field, Potter county, Pa. Joint project with United Natural Gas Co., Oil City.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1573 for 419 miles 26- and 30-in. loop, 142 miles 24-in. line, 200 miles laterals, and 54,100 hp at existing and authorized stations.

TEXAS EASTERN TRANSMISSION CORP. Shreveport, to boost capacity to 1205 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connells-

JAEGER Compressors deliver up to 20% more air SPEED PIPELINE WORK



Model 125 — Delivers 125 cfm of air instead of 105, yet is as compact and portable as smaller units. Ideal for testing lines at pressures up to 125 psi.

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Portable "Sure Prime" Drainage Pumps

Extremely compact, easy-to-handle and fast automatic priming centrifugals of ample capacity for dewatering ditches. 2" size conservatively rated at 10,000 gph.

Jaeger Compressors and Pumps are sold and serviced in 130 cities. See your Jaeger distributor or send for complete catalogs.

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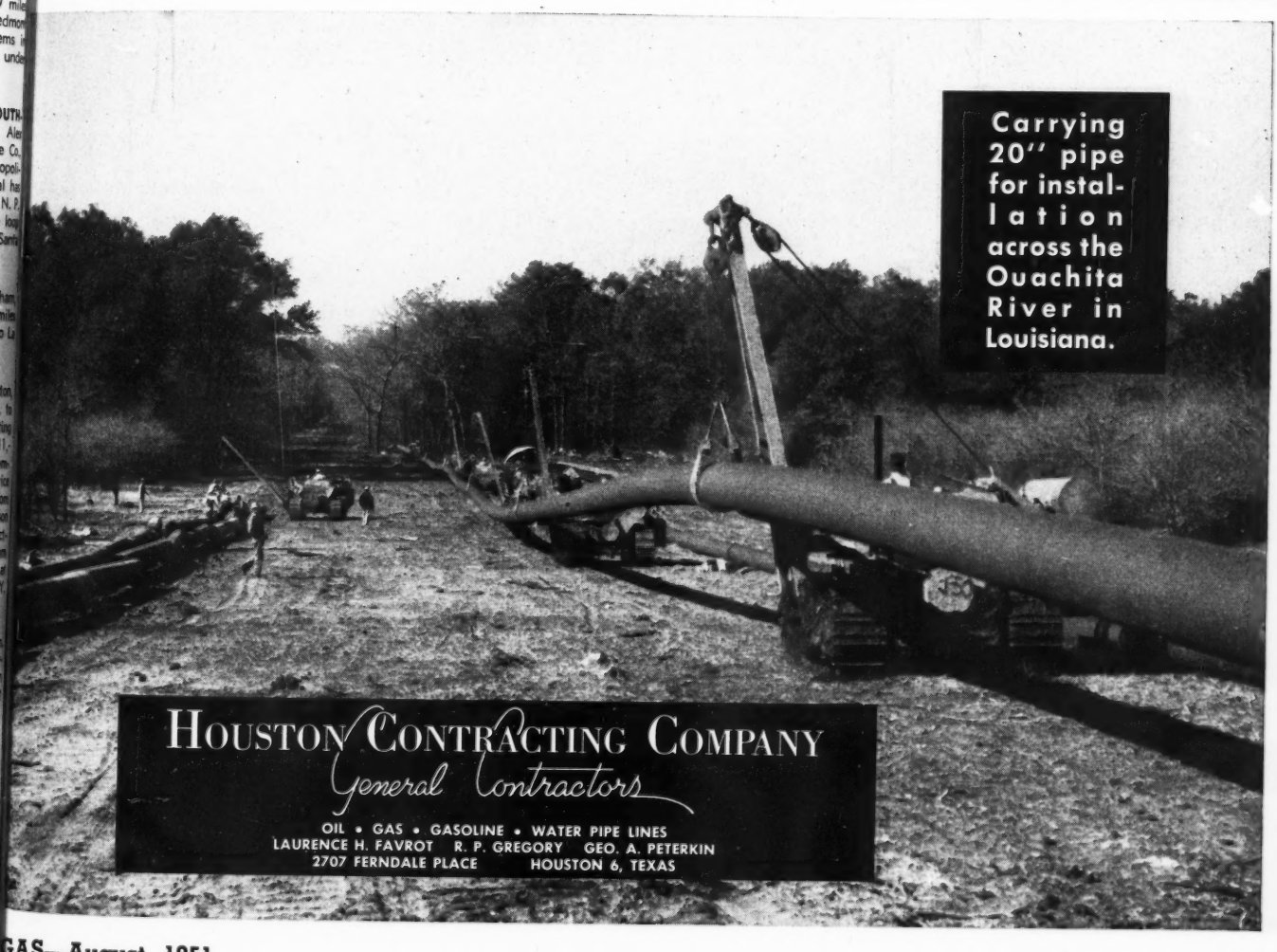
Carrying 20" pipe for installation across the Ouachita River in Louisiana.
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OIL • GAS • GASOLINE • WATER PIPE LINES
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ville, Pa.; seven compressor stations with 46,4[illegible] hp on new line, six with 52,500 hp on existi[illegible] line; short lines in New York area. Willia[illegible] Brothers-Davis Co. is at work on 163.6 miles [illegible] 30-in. line from Kosciusko, Miss., to the Te[illegible] nessee river. Mahoney Contracting Co. at wo[illegible] on 100 miles 30-in. from Ohio river to Kentuc[illegible] river and 35 miles of 30-in. from Connellsvi[illegible] to Delmont, Pa. Eastern Pipe Line Contracto[illegible] on 76 miles of 30-in. from Tennessee river [illegible] Columbia, Tenn. H. B. Zachry Co. on 73 mi[illegible] of 30-in. from Columbia, Tenn. to Cumberla[illegible] river. N. A. Saigh Co. Inc. on 80 miles of 30-[illegible] from Columbia, Ky. to Kentucky river.

TEXAS GAS TRANSMISSION CORP., to deve[illegible] the Alford storage field near Petersburg, In[illegible] a 12-mile line, 4½ miles field lines, a 1200-[illegible] storage field station.

TEXAS-ILLINOIS NATURAL GAS PIPELINE C[illegible] Chicago, on its 1331-mile line, Midwestern G[illegible] structors Inc., 102 miles of 30-in. from Mis[illegible] sippi river near Chester, Ill., to St. Elmo, Ill. 7[illegible] completed; 100 miles 30-in. from Effingham[illegible] Sibley, Ill., 92 miles 30-in. from Sibley to Jol[illegible] Ill. 50% completed; Mississippi river cross[illegible] at Wittenberg, Mo. started June 1; 101 m[illegible] 30-in. Moark, Ark. to Mississippi river [illegible] Chester, Ill. 11.7% complete. Bechtel C[illegible] under way on 106 miles 30-in. from Te[illegible] Ark. line to Malvern, Ark., 58.3% complete; [illegible] 74 miles 30-in. from Newport to Moark, A[illegible] 90% complete; on 130 miles, Malvern, Ark. [illegible] Newport, 10.2% complete. Fish Construct[illegible] Inc., Houston, is building compressor stat[illegible] and has subcontracted to Hydrocarbon Constr[illegible] tion Co. work on four compressor stations at M[illegible] Caney and Marshall, Tex. and Malvern [illegible] Biggers, Ark. H. C. Price Co. at work on [illegible] miles of 30-in. from Urbana to Garrison, Te[illegible] also on 96 miles 30-in. from Garrison north[illegible] to Texas-Arkansas state line near Texarka[illegible] 60% completed. Ray L. Smith at work on [illegible] miles from Joliet, Ill. to Volo meter station.

TRANSCONTINENTAL GAS PIPE LINE CO[illegible] Houston. Docket G-1685 for 7200 ft of 12[illegible] in. line and appurtenant facilities for Dela[illegible] river crossing near Marcus Hook, Pa.

TRANSCONTINENTAL GAS PIPE LINE CO[illegible] Houston. Docket G-1518 for 17 miles 30-[illegible] 10¾-in. from Bergen county, N. J. to Pater[illegible] N. J.

TRANSCONTINENTAL GAS PIPE LINE CO[illegible] Houston. Docket G-1414 for an 11-mile l[illegible] from East Carteret, N. J. to Brooklyn.

TRANSCONTINENTAL GAS PIPE LINE CO[illegible] Houston. Docket G-1411 for 45,675 hp [illegible] compressor capacity at existing stations and [illegible] sales meter stations.

TRUNKLINE GAS CO., Houston, under way [illegible] its 740-mile Louisiana-to-Illinois line, 560 m[illegible] of laterals and 32,000 hp in main line compr[illegible] sor stations.

UNITED GAS PIPE LINE CO., Shreveport, [illegible] miles 16-in. from Baldwin county, Ala., to E[illegible] cambia county, Fla.; two laterals to Sauf[illegible] field. Also tap and sales meter stations.

UNITED GAS PIPE LINE CO., Shreveport, 10[illegible] miles in Texas, Louisiana, and Mississippi. I[illegible] cludes 504.7 miles 30-in., 6 miles 26-in., 53 mi[illegible] 24-in. from Agua Dulce field in south Texas [illegible] Monroe, La.; about 245 miles of 30, 26, 24, a[illegible] 20-in. from Gulf of Mexico northeast to Jacks[illegible] Miss.; 59.6 miles from this line to near Ko[illegible] ciusko, Miss. Contracts have been awarded [illegible] Brown & Root Inc., Houston, for engineerin[illegible] construction, and other services and to Gu[illegible] Southern Contractors, Fort Worth, for other m[illegible] jor work on the project. In offshore fields in G[illegible] of Mexico: 12.3 miles 14-in. line. H. C. Price C[illegible] has signed a contract for the Somastic coati[illegible] of 137 miles of line to be laid in south centr[illegible] Louisiana. Also under way are 68.1 miles [illegible] 16-in.; 25½ miles 6-, 8-, 10- and 12-i[illegible] gathering lines from fields in Plaquemines pa[illegible] ish, La. to New Orleans.

UNITED NATURAL GAS CO., Oil City, P[illegible] Docket G-1614 for 89,530 ft of line and a[illegible] purtenant facilities and 21,120 hp in a n[illegible] station in Hebron field, Potter county, Pa. Join[illegible] project with Tennessee Gas Transmission Co.